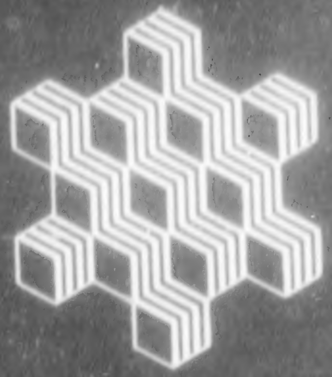
Curriculum Guide



SECONDARY SCHOOL

INTRODUCTION TO TECHNOLOGY
- GENERAL METHODOLOGY
- PLANNING MODEL

GENERAL EDUCATION

Québec

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Le guide pédagogique, préparé par la Direction des programmes de la DGEC, est un document destiné à faciliter l'enseignement du cours d'introduction à la technologie. Son utilisation est laissée au choix de l'enseignant. Le guide est strictement parallèle au cours; il suggère des stratégies pédagogiques pour aider les enseignants à planifier leurs cours. Chaque thème est traité en détail; les objectifs généraux et intermédiaires de chaque thème sont rappelés. On présente également le contenu de l'apprentissage pour chaque objectif intermédiaire et une ou plusieurs méthodes d'évaluation. On y propose également des listes de références bibliographiques et de matériels didactiques.

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Direction générale des programmes
Direction de la formation générale

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FOREWORD

This curriculum guide, prepared by the Direction des programmes of the Direction générale du développement pédagogique of the ministère de l'Éducation, is an optional support document designed to facilitate teaching of the Introduction to Technology course.

Its production has entailed many hours of painstaking research and work under the supervision of the person in charge of courses and programs in the Introduction to Technology sector. Editors, educational development officers, and the members of the Comité de revision des programmes have all contributed to the production of this guide.

The guide closely parallels the course and includes suggested instructional strategies to help teachers in planning their approaches. Each of the themes is covered in detail and their general and terminal objectives stated. Learning content and one or more evaluation procedures are provided for each of the intermediate objectives. Lists of bibliographic references and suggested instructional materials are also included.

It is recognized that this guide will need to be updated and revised in time and teachers are invited to help in this task by sending in their comments and suggestions.

The traditional masculine forms of speech are used throughout this document; however, both genders should be understood.

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CHAPTER 1

INTRODUCTION*

There is evidence dating back to prehistoric times that man has always sought to improve the conditions of his life through technology and invention by making a variety of tools and technical products to answer his many needs. While this process has been going on for many centuries, it has never been more widespread than it is in the second half of the twentieth century, a period of industrial expansion without equal. In societies such as ours, technical products, from the simplest to the most sophisticated, play an integral role in everyone's life and constitute a cultural dimension that cannot be ignored.

The great industrial nations, particularly those in Europe and North America, have developed systems of education which take into account the importance of technology in the lives of their people.

It must be acknowledged that in Québec, technology has evolved at a slower pace and that its cultural importance was not generally understood until it was identified and explained by the Commission royale d'enquête sur l'enseignement au Québec in the early sixties. The Commission recommended that, in the light of the cultural and educational importance of technology, courses in technology should be made available to all pupils enrolled in secondary schools.

The delay in recognizing the educational value of technology has produced negative results that are clearly visible. We have become consumers rather than inventors or producers of technical products. Moreover, as consumers, we are not always well-informed. We do not understand technical products, but instead of deploring this fact we almost seem to be proud of it. How often have we heard a friend or a neighbour openly admit that he has no understanding of technical matters or any mechanical ability? We feel that this area of knowledge is not our concern and yet, as consumers, it should be of concern to all of us. We all use cars today and yet most of us do not understand even the most elementary principles of the operation of a car. This state of affairs cannot continue indefinitely.

Man has invented technology and technical products to improve the quality of his life and therefore it is important that he control technology and not become a slave to it. The role of the school must be to clear away the mystery surrounding technology by making courses in technology available to all boys and girls. Gaining an understanding of technology is an important factor in individual development and independence.

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* All the sections marked with an asterisk are excerpts from the Introduction to Technology course (Code 16-4888A).

If pupils are to understand and be able to use technology, the mystery surrounding it must be removed. The pupil should:

- know that every technical product has been invented to meet a particular need;
- know the process to follow from identification of a given need to the construction of a technical product;
- develop his own ability to design and construct technical products;
- acquire a basic knowledge of technology and be able to interpret technical drawings;
- learn how to use common tools;
- be introduced to the organization and sociology of labour;
- understand the direct influence technology has on our lives in general and on our working environment.

These are the main goals of this Introduction to Technology course based on the objectives stated in The Schools of Québec.

OUTLINE OF THE INTRODUCTION TO TECHNOLOGY COURSE*

It should be noted that inclusion of an Introduction to Technology course in the secondary school general curriculum is not unique to Québec. Most of the industrialized nations include technology courses in their secondary school general programs. These courses have a variety of titles: Technological Education, Manual and Technical Education, Industrial Arts, Practical Technology, and so on.

Technology specialists in every country, while they may favour different philosophies regarding the teaching of technology, generally agree that the technological course should be centred in some way on the technical object or product.

A study of a technical product involves learning:

- why it is made
- how it is made
- how and why it operates
- how it can be produced.

Technological study comprises two phases:

- The theoretical or intellectual phase: The design stage, which requires logic and creativity as well as technological, scientific, and mathematical knowledge.

- The practical phase: The production stage, which requires imagination and initiative as well as manual skills, perception of form and detail, and a sense of organization.

The teaching of technology, then, includes both theory and practice. It should not be confused with vocational education, which is designed to enable the pupil to acquire a trade skill. The teaching of technology, which is described here, is of a cultural nature and is included in the general curriculum.

RELATIONSHIP BETWEEN THIS COURSE AND THE BASIC OBJECTIVES AND VALUES OF SECONDARY SCHOOL EDUCATION*

If the aims and values of our school system are to be comprehensive and ensure the development of the pupil as a whole person, they must take into consideration all the disciplines which play a role in this development. If a single aspect of human development is neglected, its lack will have a limiting effect on the cultural aspirations of the people. Technology, as stated earlier, has an impact on the behaviour of everyone all the time. An understanding of technology contributes to the intellectual, sensorimotor, aesthetic, affective, social, and moral development of the pupil and should be recognized as one of the most important objectives of the Québec school system.

The Introduction to Technology course reflects many of the values promoted in The Schools of Québec, from which it draws its inspiration.

In terms of intellectual values, the discovery and application of technological principles requires methodical work habits, whereas finding solutions to technical problems, using a systematic approach based on logic, requires intellectual discipline. Analysis of technical products and assessment of their relative value calls for critical judgement and encourages the search for truth and intellectual honesty. The search for technological solutions to practical problems encourages inventiveness and technical as well as artistic expression.

In learning to use a variety of tools to process different materials, the pupil develops his sensorimotor skills and eye-hand coordination. A minimum amount of technical knowledge gives the pupil a degree of self-reliance in dealing with technical products. This self-reliance enables the pupil to choose products more discriminatingly, to use and maintain them in a reasonable fashion and even, now and again, to detect and repair minor problems.

In studying different technical products, the pupil gains a broader understanding of the affective, social, and moral aspects of the world around him. In explaining the solutions to specific problems, the pupil develops his communication skills and in team work he develops a sense of belonging, respect for others, and team spirit. The construction of technical products develops precision and gives him a sense of a job well-done.

To sum up, it should be emphasized that the Introduction to Technology course, in addition to contributing to the main goals of the Québec school system, transmits basic values and provides the means to acquire special knowledge and skills. It is also particularly well-suited to an interdisciplinary approach. It integrates language, mathematics, history, and geography. It is, in effect, a crossroads of all the different disciplines.

GENERAL ORIENTATIONS OF THE COURSE*

In order to cover a representative variety of subjects in the field of technology, this course comprises five themes for teachers to develop with their pupils. These themes do not correspond to specific subjects in vocational education. They correspond to broader areas of technology and are based on ideas and experiences which are familiar to the pupil. They provide an opportunity to analyze the many needs of mankind and the solutions that have been found through technology to answer these needs.

Each theme constitutes a section of the course. Each has a general objective which describes what the pupil should have achieved at the end of each theme. There are also a number of terminal objectives, each of which contributes to the attainment of the general objective. Most of the terminal objectives and learning content are compulsory but some are optional and will, time permitting, add enrichment to the course. For this reason, the time suggested for each theme, though not compulsory, should be followed as closely as possible. The time allotment for each theme varies from fourteen to thirty periods of 50 minutes each.

The five themes are:

- Technology in the life of man
- Building/construction technology
- Mechanical technology
- Electrical technology
- Technology in the world of work.

The first four themes cover the process of design and production of technical products, the fifth covers mass production of products from a prototype that has already been developed and tested.

STRUCTURE OF THE COURSE

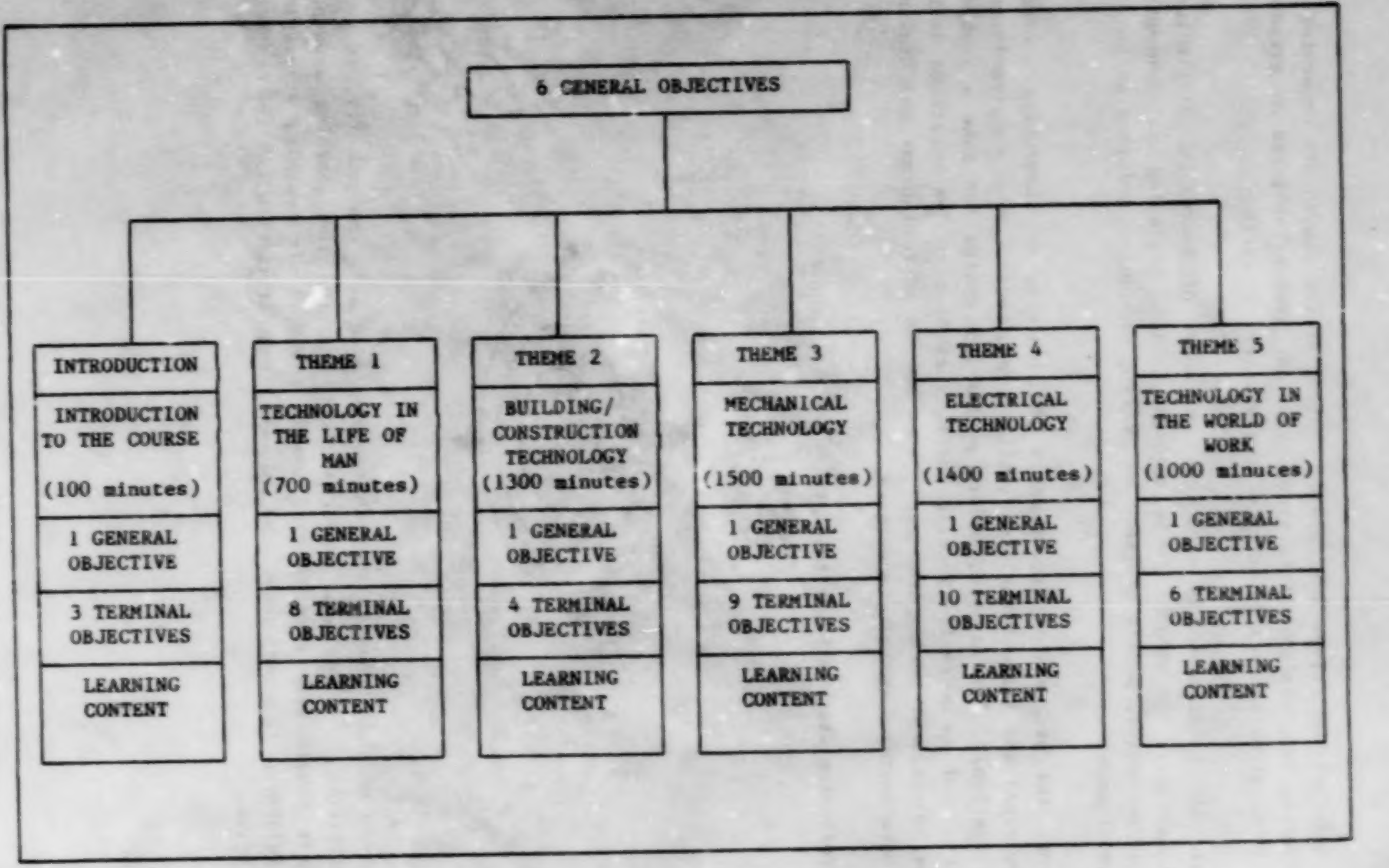
The course is built around a sequential progression of objectives. The general objectives specify the main orientations of the course and provide teachers with guidelines for planning and selecting their overall approach and particular strategies.

The general objectives of the course are related to the general objectives of the themes. Each theme has a general objective which describes the results expected of pupils on completion of the theme.

The general objectives of the themes are achieved by means of a number of terminal objectives which describe a learning behaviour or outcome. Terminal objectives are accompanied by appropriate related content.

To sum up, each theme incorporates structured learning content, of varying scope, that is closely linked to the terminal objectives and to the general objective. Together these make up the course. The following diagram shows the interrelationship of these different elements.

INTRODUCTION TO TECHNOLOGY (6000 minutes)



6 GENERAL OBJECTIVES

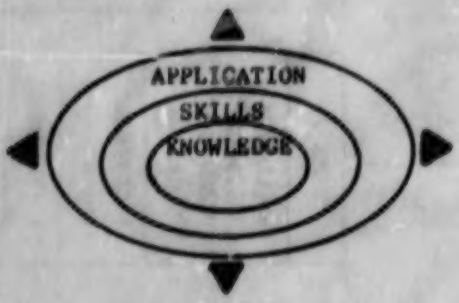
INTRODUCTION	THEME 1	THEME 2	THEME 3	THEME 4	THEME 5
INTRODUCTION TO THE COURSE (100 minutes)	TECHNOLOGY IN THE LIFE OF MAN (700 minutes)	BUILDING/ CONSTRUCTION TECHNOLOGY (1300 minutes)	MECHANICAL TECHNOLOGY (1500 minutes)	ELECTRICAL TECHNOLOGY (1400 minutes)	TECHNOLOGY IN THE WORLD OF WORK (1000 minutes)
1 GENERAL OBJECTIVE	1 GENERAL OBJECTIVE	1 GENERAL OBJECTIVE	1 GENERAL OBJECTIVE	1 GENERAL OBJECTIVE	1 GENERAL OBJECTIVE
3 TERMINAL OBJECTIVES	8 TERMINAL OBJECTIVES	4 TERMINAL OBJECTIVES	9 TERMINAL OBJECTIVES	10 TERMINAL OBJECTIVES	6 TERMINAL OBJECTIVES
LEARNING CONTENT	LEARNING CONTENT	LEARNING CONTENT	LEARNING CONTENT	LEARNING CONTENT	LEARNING CONTENT

The terminal objectives and related content of the course are presented in a sequential progression. This progression has been established by presenting the terminal objectives in terms of two specific criteria.

First, the progression is structured in order of increasing difficulty or abstraction of the content to be mastered. Thus, beginning with concepts of static mechanics, pupils progress to dynamic mechanics, and then on to electrical concepts.

Second, the progression incorporates the learning of theoretical concepts (knowledge) and basic techniques (skills) required for more complex learning (application). For example, before pupils can design and make a technical object, such as a small electric motor, they have to learn certain definitions, electrical principles, etc., know how to make diagrams and drawings, and have mastered certain techniques.

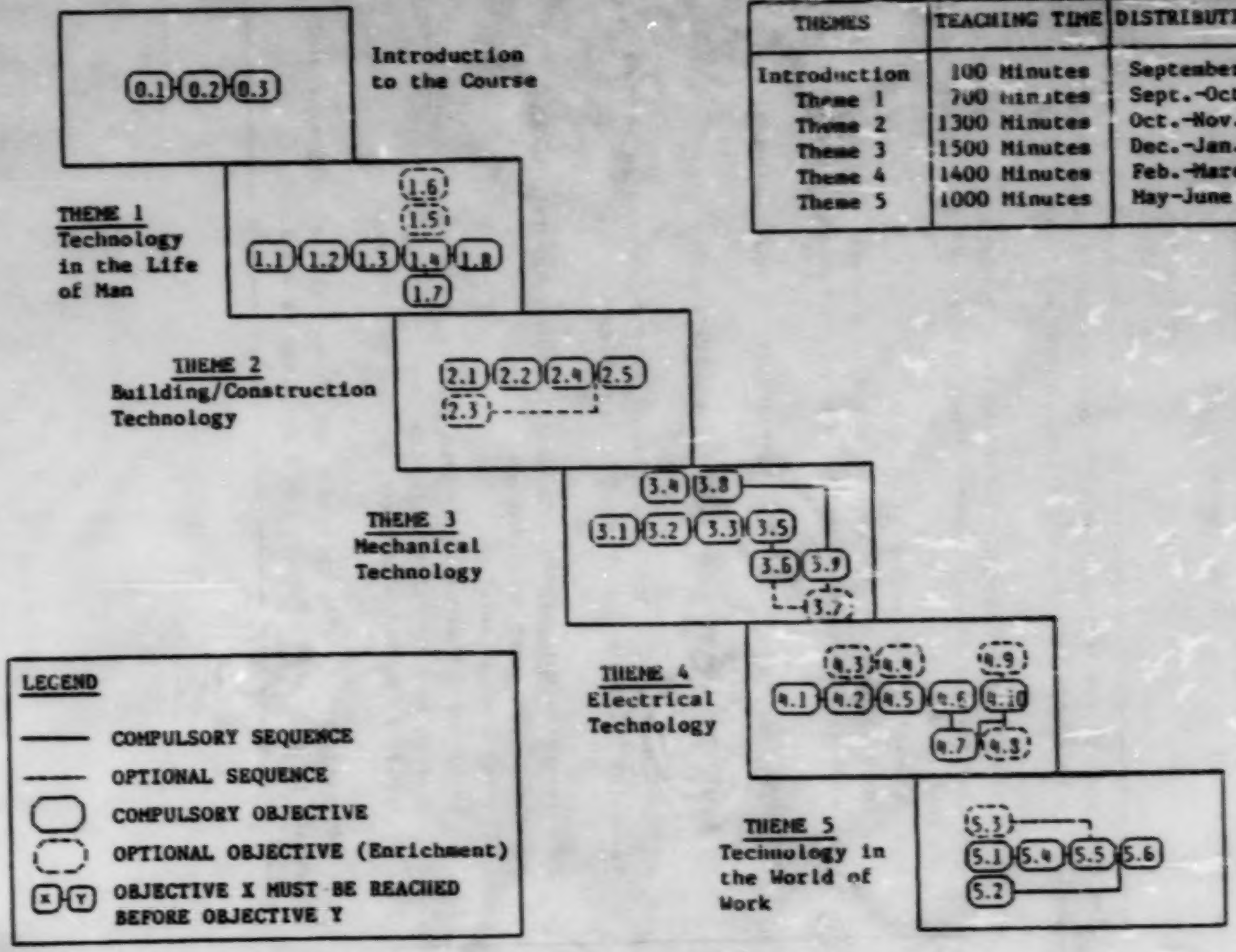
The following diagram illustrates this learning sequence:



The order of the themes follows this progression and, consequently, it would be difficult to alter this order without changing the learning sequence. Teachers should keep this in mind when planning their teaching strategies. The following diagram shows the sequential presentation of the terminal objectives.

SEQUENTIAL PRESENTATION OF THE TERMINAL OBJECTIVES OF THE COURSE

THEMES	TEACHING TIME	DISTRIBUTION
Introduction	100 Minutes	September
Theme 1	700 Minutes	Sept.-Oct.
Theme 2	1300 Minutes	Oct.-Nov.-Dec.
Theme 3	1500 Minutes	Dec.-Jan.-Feb.
Theme 4	1400 Minutes	Feb.-March-April
Theme 5	1000 Minutes	May-June


0.1
0.2
0.3
Introduction to the Course
THEME 1
Technology in the Life of Man
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
THEME 2
Building/Construction Technology
2.1
2.2
2.3
2.4
2.5
THEME 3
Mechanical Technology
3.1
3.2
3.3
3.4
3.5
3.6
3.7
3.8
3.9
THEME 4
Electrical Technology
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
4.10
THEME 5
Technology in the World of Work
5.1
5.2
5.3
5.4
5.5
5.6
LEGEND
COMPULSORY SEQUENCE
OPTIONAL SEQUENCE
COMPULSORY OBJECTIVE
OPTIONAL OBJECTIVE (Enrichment)
X
Y
OBJECTIVE X MUST BE REACHED BEFORE OBJECTIVE Y

GENERAL OBJECTIVES OF THE INTRODUCTION TO TECHNOLOGY COURSE*

The general objectives of this course do not describe learning situations or evaluation procedures. They give the broad orientations for the course and serve as a guide for teachers in planning their teaching activities and in selecting an appropriate methodology. They also provide the pupil with an overall view of the content of the course.

The main goal of the Introduction to Technology course is to provide the pupil with knowledge, skills, and attitudes that will enable him:

- to discover the technological principles of construction, mechanics and electricity, through practical application of these principles, so that he will:
    - understand the technical product,
    - make intelligent use of the technical product,
    - understand how the technical product influences the life of man;
- to learn logical step-by-step techniques for problem solving;
- to learn the rudiments of graphic communication;
- to use his inventive ability and sense of form and design in seeking technological solutions to practical problems;
- to practice techniques that are useful in everyday life in the process of constructing mock-ups:
    - using common tools,
    - using and transforming certain primary materials,
    - putting into practice certain production processes,
    - applying knowledge acquired in other disciplines;
- to develop his capacity to reason and to use critical judgement with regard to technical products and technology in general.

GENERAL PRINCIPLES OF INSTRUCTION*

Active Participation

The teacher should remember that the pupil has the main responsibility for his own development. If the pupil is to learn, he must be an active participant in class and be encouraged to use all his faculties. A pupil will participate if he is motivated, and motivation depends on personal tastes, interests and aptitudes. The pupil must be given real problems to which he must find his own solutions. This type of approach is called situational learning.

Search for Solutions

Pupils in Introduction to Technology classes should seek solutions to problems that a well-prepared and skilled teacher presents to them or that they set for themselves. The solutions will not all be of equal value and pupils must be taught to select those that are most appropriate by using a combination of reasoning, logic, and critical judgement. In this way, the teacher will teach pupils how to learn by themselves instead of limiting them to learning facts. This type of education is more important than simply obtaining information. It was this principle that Montaigne summed up four centuries ago when he said, "It is better to have a well-trained mind than a well-filled mind."

BASIC GUIDELINES

The teacher should take into account the following guidelines:

- The teacher should explain to the pupils, in simple terms, the aims and general objectives of the course;

- The teacher should show the pupils that he is not a walking encyclopedia who explains everything and answers every question. He is an animator, a guide who shares the process of discovery with pupils;

- The teacher should avoid traditional lecture-type lessons as much as possible. Discovery of laws and principles through observation, reflection, intuition, and experimentation (inductive method) stimulates the interest of pupils and enables them to retain knowledge;

- The teacher should plan realistic experiments, use simple and attractive models, and provide activities which take into consideration the pupil's background, interests, capabilities, and age;

- The teacher should emphasize the interdisciplinary aspects of the course. Particular attention should be paid to spoken and written language;

- The teacher should hold his classes in workshops that are equipped according to the standards set by the ministère de l'Éducation;

- The teacher should possess a broad knowledge of technology in the areas of construction, woodworking, mechanics, and electricity. In addition, the teacher should have training in educational psychology and teaching methodology related to technology.

EVALUATION PROCEDURES AND MEASUREMENT INSTRUMENTS FOR INTRODUCTION TO TECHNOLOGY

Evaluation and measurement are being used more and more frequently in the school system. Measurement is used to obtain information concerning the scholastic performance or general progress of the pupil. Evaluation is assessment of this information for the purpose of decision making. The main objective of educational evaluation should be to improve the teaching process.

There are two forms of evaluation: formative evaluation and summative evaluation.

Formative evaluation is used to inform the pupil and the teacher of the extent to which an objective has been achieved and, if difficulties are being experienced, their nature and source. It should take place at the end of each learning activity.

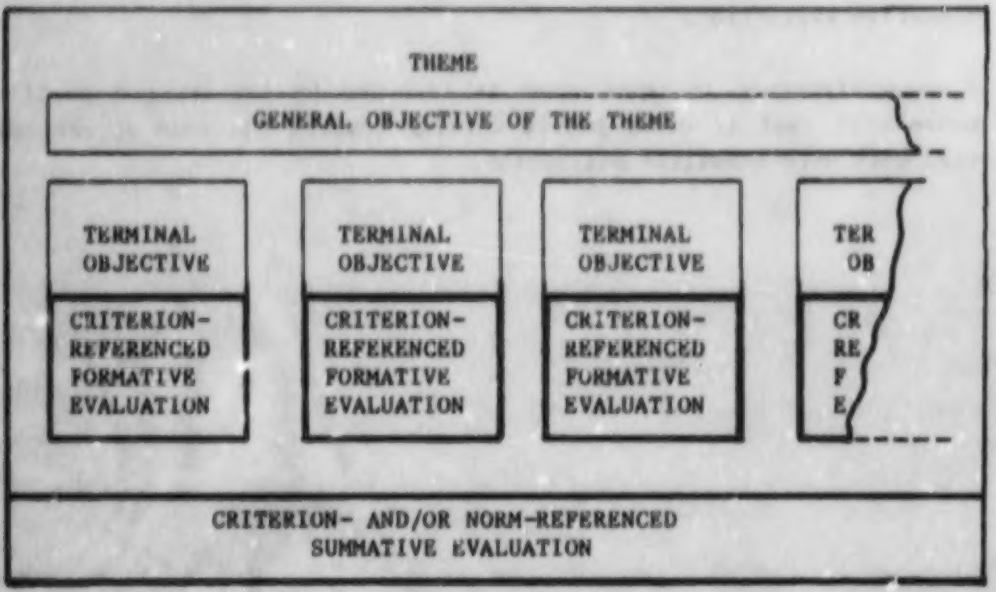
Summative evaluation is a sort of balance-sheet which is used to inform the pupil and the teacher whether a set of objectives has been achieved. It is carried out at the end of a set of learning activities.

Different measurement instruments are used to obtain information for these two forms of evaluation. Interpretations of performance may be criterion-referenced or norm-referenced.

A criterion-referenced interpretation is effected by comparing a pupil's performance with the level of performance expected for one or more objectives, without reference to the performance of other pupils. This type of interpretation is used primarily with formative evaluation but may also be used with summative evaluation.

A norm-referenced interpretation is effected by comparing a pupil's performance with that of other pupils working towards the same objectives. It is used only with summative evaluation.

The following diagram shows how these measurement concepts are applied in the Introduction to Technology course.


THEME
GENERAL OBJECTIVE OF THE THEME
TERMINAL OBJECTIVE
CRITERION-REFERENCED FORMATIVE EVALUATION
TERMINAL OBJECTIVE
CRITERION-REFERENCED FORMATIVE EVALUATION
TERMINAL OBJECTIVE
CRITERION-REFERENCED FORMATIVE EVALUATION
TER OB
CR RE F E
CRITERION- AND/OR NORM-REFERENCED SUMMATIVE EVALUATION

In ordinary, daily school practice, both the norm-referenced and criterion-referenced modes of interpretation may be used for the scores of the same test. It is therefore not always necessary to use different tests for the two kinds of interpretation. It should not be the type of test which determines which kind of interpretation is to be given to the scores but the kind of information the teacher needs.

In Introduction to Technology, formative evaluation is used to ascertain the extent to which a terminal objective has been attained. When teaching is individualized, as it often is in a workshop situation, this form of evaluation may be effected by means of objective tests and development tests or a combination of the two.

Formative evaluation may be used to assess the quality of certain work carried out by the pupil during the production of a prototype (diagrams, drawings, mock-ups, reports of experiments). It may also be used to evaluate verbal responses or manual dexterity in constructing a technical product, or the quality of the finished product. An evaluation form with specific criteria is particularly suitable for evaluating a prototype. Oral examinations, while time consuming, enable the teacher to assess how well the pupil understands the principles of operation of the product he has made.

Summative evaluation is used to check the extent to which certain terminal or general objectives of the theme and the course have been attained. It may be carried out at the end of a theme, a term, or a year. It may be effected by means of objective tests. Examination questions may be prepared at the regional level, with individual schools being responsible for evaluating the results. These tests can be analyzed by computer and the results used to facilitate the development of valid tests. It should be noted that teachers getting together in a given region to make up lists of examination questions leads to greater cooperation and encourages the exchange of ideas and the revision of teaching methods if their objectives are not being achieved.

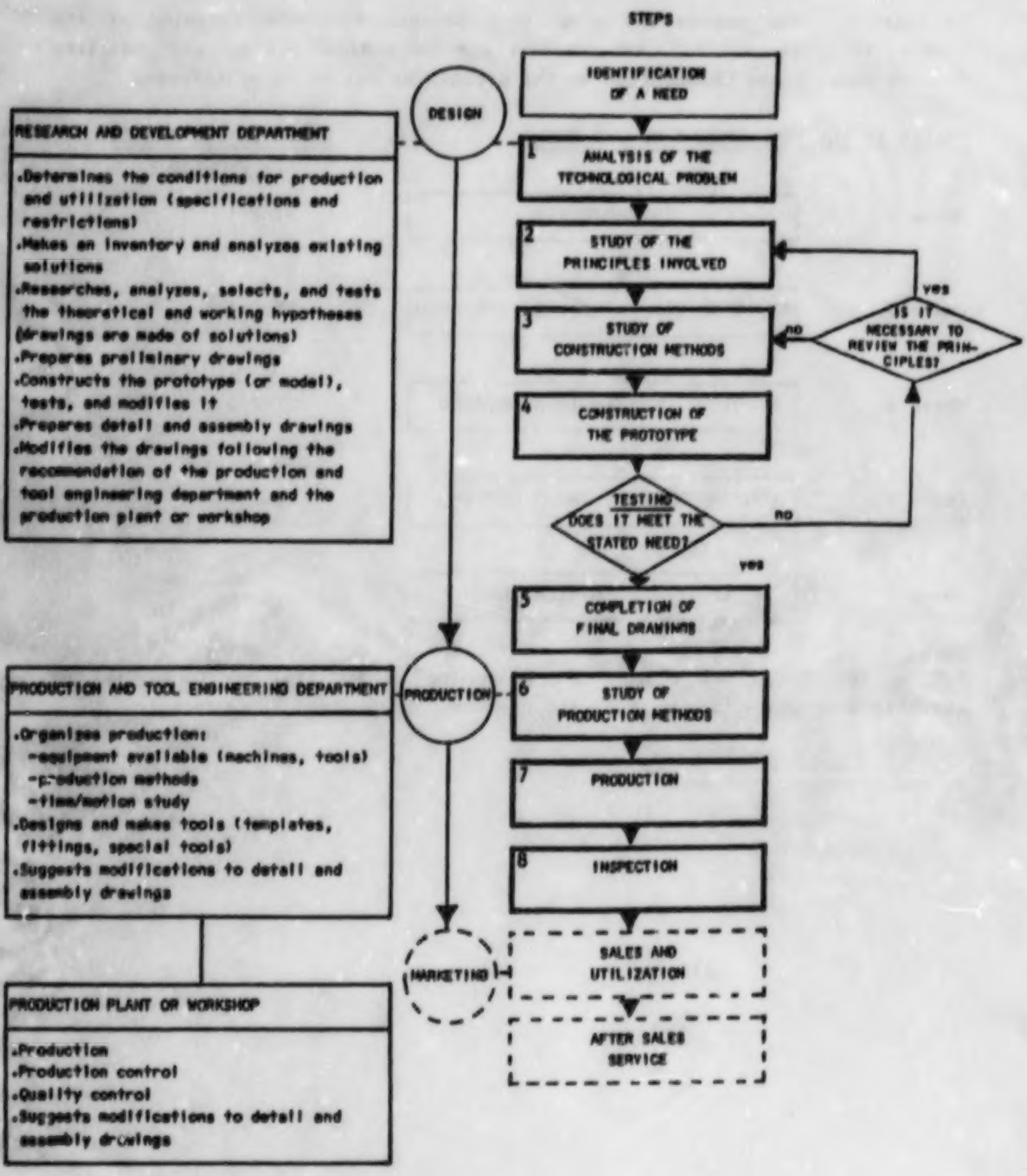
GENERAL METHODOLOGY

To review, a technology course should be centred in some way on the technical object. Technological study should always comprise a theoretical (or intellectual) phase and a practical phase.

It follows, then, that the Introduction to Technology course should include these two aspects. The process of designing and producing a technical object should be the basis on which themes are developed. The following diagram shows the steps in this process.

These steps start with the identification of a need and go through to the final inspection. The bottom part of the diagram (dotted lines) shows subsequent steps which are not covered in the course. In the design phase, the systemic aspect of the process is highlighted. On the left side of the diagram, the principal components of an industrial enterprise and their main responsibilities are listed.

PROCESS FOLLOWED IN DESIGNING AND PRODUCING A TECHNICAL OBJECT


STEPS
DESIGN
IDENTIFICATION OF A NEED
1 ANALYSIS OF THE TECHNOLOGICAL PROBLEM
2 STUDY OF THE PRINCIPLES INVOLVED
3 STUDY OF CONSTRUCTION METHODS
4 CONSTRUCTION OF THE PROTOTYPE
TESTING DOES IT MEET THE STATED NEED?
no
yes
IS IT NECESSARY TO REVIEW THE PRINCIPLES?
yes
no
5 COMPLETION OF FINAL DRAWINGS
PRODUCTION
6 STUDY OF PRODUCTION METHODS
7 PRODUCTION
8 INSPECTION
MARKETING
SALES AND UTILIZATION
AFTER SALES SERVICE

RESEARCH AND DEVELOPMENT DEPARTMENT

- Determines the conditions for production and utilization (specifications and restrictions)
- Makes an inventory and analyzes existing solutions
- Researches, analyzes, selects, and tests the theoretical and working hypotheses (drawings are made of solutions)
- Prepares preliminary drawings
- Constructs the prototype (or model), tests, and modifies it
- Prepares detail and assembly drawings
- Modifies the drawings following the recommendation of the production and tool engineering department and the production plant or workshop

PRODUCTION AND TOOL ENGINEERING DEPARTMENT

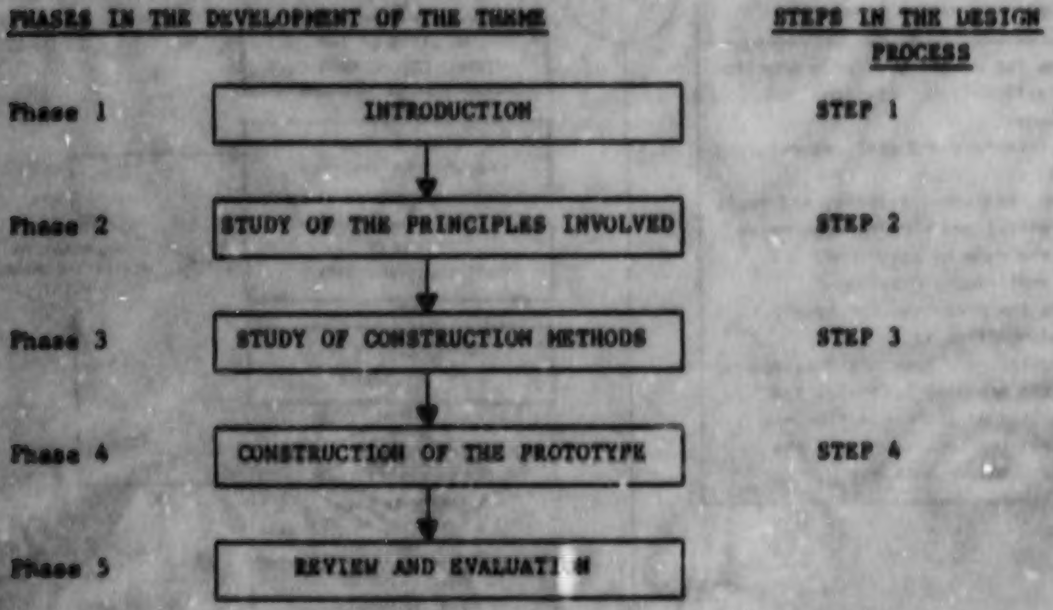
- Organizes production:
  - equipment available (machines, tools)
  - production methods
  - time/motion study
- Designs and makes tools (templates, fittings, special tools)
- Suggests modifications to detail and assembly drawings

PRODUCTION PLANT OR WORKSHOP

- Production
- Production control
- Quality control
- Suggests modifications to detail and assembly drawings

SUGGESTED PROCEDURE FOR TEACHING THEMES 1 - 4

To integrate the design and production process into the teaching of the themes, it is recommended that teachers use the following model for the first four themes. These themes involve the process of designing prototypes.


PHASES IN THE DEVELOPMENT OF THE THEME
STEPS IN THE DESIGN PROCESS
Phase 1
INTRODUCTION
STEP 1
Phase 2
STUDY OF THE PRINCIPLES INVOLVED
STEP 2
Phase 3
STUDY OF CONSTRUCTION METHODS
STEP 3
Phase 4
CONSTRUCTION OF THE PROTOTYPE
STEP 4
Phase 5
REVIEW AND EVALUATION

Note: For the final theme, the procedure is modified to focus on the assembly-line production part of the process.

SUGGESTED PROCEDURE FOR TEACHING THEME 5

PHASES IN THE DEVELOPMENT OF THE THEME		STEPS IN THE DESIGN PROCESS
Phase 1	INTRODUCTION	STEP 1
Phase 2	BRIEF STUDY OF THE PRINCIPLES INVOLVED AND CONSTRUCTION METHODS	STEPS 2 and 3
Phase 3	STUDY OF PRODUCTION METHODS	STEPS 5 and 6
Phase 4	ASSEMBLY-LINE PRODUCTION	STEPS 7 and 8
Phase 5	REVIEW AND EVALUATION	

Teachers should begin this theme by briefly reviewing the design of the prototype. This will help pupils to see the relationship between the different steps of the process.

PHASES IN THE DEVELOPMENT OF THEMES 1 - 4

INTRODUCTION (Phase 1)

The introduction phase for each theme should stimulate pupils' interest in the subject to be studied. In this phase, teachers should specify the general and terminal objectives for the theme, the process to be followed in developing the theme, the amount of time to be devoted to the theme, as well as the need which pupils will try to meet by designing and constructing an appropriate and interesting technical object. It is a good idea, at this time, to review briefly the general objectives of the course in order to give pupils an overview of the interrelationship of the themes. The way in which the teacher presents the problem to be solved, and the choice of object to be produced in response to a clearly identified need, can make all the difference between success or failure in achieving the objectives of the theme.

STUDY OF THE PRINCIPLES INVOLVED (Phase 2)

This phase involves making a prototype to meet the need that has been identified, within the framework of predetermined restrictions and conditions. The teacher should choose a realistic situation, based on pupils' experience and capabilities, and, building on their accumulated knowledge, should ask them a series of logical questions designed to help them formulate theoretical hypotheses for resolving the problem. The hypotheses should apply both to the whole technical object and to its component parts. These hypotheses should then be analyzed and evaluated in order to select the best ones to use.

In this phase, pupils are looking for theoretical solutions to the problem, whereas later on they will be seeking concrete ways to implement their solutions. The emphasis here is on pupils using their intellectual abilities and inventiveness, and applying their knowledge of science, mathematics, etc.

This phase includes a number of terminal objectives and appropriate related content.

STUDY OF CONSTRUCTION METHODS (Phase 3)

In this phase, pupils, having found theoretical solutions, should go on to find practical solutions to the problem--the overall appearance of the object, its dimensions, the nature and form of its components, materials to be used--in brief, all the specifications required to construct the technical object.

Here again, pupils should formulate hypotheses for each of these practical aspects. These working hypotheses should also be analyzed and evaluated in order to select the best of them--the most feasible, given the type of object to be made, available materials and equipment, and pupils' capabilities.

It is recommended that, while principles and construction methods are often studied at the same time in the design process, the teacher should make sure that pupils distinguish between the two as this will give them a clearer picture of the whole process.

It should be remembered that it is essential to use schematic drawings in Phases 2 and 3, because they illustrate in a few lines information that would take considerable time to explain. Schematic drawings will also make it much easier to prepare the drawings required to construct the prototype or object.

This phase also includes a number of terminal objectives and appropriate related content.

CONSTRUCTION OF A PROTOTYPE (Phase 4)

Most of the terminal objectives of the theme are covered in the preceding phases, but this phase deals with the last of these objectives--constructing a prototype--which is, for pupils, the most interesting part of the process.

The teacher should see to it that pupils fully understand the drawings for constructing the object and how each part fits into the whole, before going on to examine different production and assembly specifications. To do this, the teacher can ask pupils to complete parts, rather than the whole, of these sheets.

The next step is to make the parts or components of the object. The teacher should first demonstrate the proper use of tools and techniques for transforming and forming the materials required according to the construction specifications. Pupils can then begin to assemble their objects, learning in the process a number of techniques and tool-handling skills. The teacher should emphasize correct techniques and the proper care of tools as well as safety rules to be observed.

When pupils have completed the assembly, they should check how well the object functions, correct any problems, and give it an attractive finish. They should also make sure that it meets the initial need. If desired, they can carry out a brief comparative analysis with a similar commercial object.

REVIEW AND EVALUATION (Phase 5)

After the object has been constructed, it is a good idea to review the whole procedure followed during the theme in order to give pupils an opportunity to identify their particular strong and weak points. The review can be quite brief and still be an effective learning experience for both teacher and pupils. It can be used as the basis on which the other themes will be developed and to show the teacher ways in which teaching strategies can be modified to improve learning. Summative evaluation of the pupil's performance should be carried out during this phase.

PHASES IN THE DEVELOPMENT OF THEME 5

INTRODUCTION (Phase 1)

See the Introduction Phase for Themes 1-4.

BRIEF STUDY OF PRINCIPLES AND CONSTRUCTION METHODS (Phase 2)

For Theme 5, it is not necessary to study principles and construction methods. Instead, pupils take an existing prototype and examine the principles involved and the way in which it is constructed, for purposes of mass producing it from detail and assembly drawings.

STUDY OF PRODUCTION METHODS (Phase 3)

This phase involves analyzing the detail and assembly drawings in order to plan the assembly-line production process and then to select the production and assembly methods to be used. The next step is to develop production and assembly specifications. Pupils will gain more from this phase if they are encouraged to develop these specifications and to design some of the specialised tools (simple templates and fittings) themselves. The appropriate layout of the work stations and the flow of parts can be covered in this phase.

ASSEMBLY-LINE PRODUCTION (Phase 4)

In this phase, pupils apply what they have studied in the preceding one. They will also be introduced to mass production with all its attendant advantages and disadvantages. As in the prototype construction phase, they will practise and develop dexterity and manual skills.

REVIEW AND EVALUATION (Phase 5)

See Phase 5 for Themes 1-4.

GENERAL PLANNING GUIDELINES

General Planning Model

Planning involves correlating the objectives with the means to achieve them. This process entails a logical sequence of steps:

1. Determining the objectives;
2. Preparing and/or choosing the means required to achieve the objectives;
3. Drawing up a plan for applying these means.

1. The first step is to establish specific objectives.
   It is important to state the objectives clearly--very general, vague objectives are difficult to translate into action and to evaluate effectively.

2. The second step is to prepare and/or choose the means to achieve the objectives.
   Teachers should draw up a list of known available means and look at how these might be used. If these means do not meet their requirements, new means or procedures should be invented or developed.

   The requirements should, of course, be realistic, relevant, and feasible.

3. The third step is to draw up a plan for applying these means.
   This involves:
   - specifying how the human, physical, and financial resources will be used;
   - specifying the when, who, how, for whom, why, etc.,
   - planning the sequence of steps to follow.

This general planning model, which can be applied in any field of endeavour, is an appropriate one for the Introduction to Technology course. Proper planning by the teacher should be regarded as an important and specific process which can be the best means to help pupils progress.

There are many advantages to be gained from well-planned instruction. Among others, it makes it possible:

- To respond to pupils' needs;
- To take into account individual learning patterns and rates;
- To maintain pupils' interest and motivation;
- To make optimum use of instructional materials;
- To avoid unnecessary expense;
- To avoid difficulties arising from improvisation;
- To make the most efficient use of teaching time.

PLANNING STRATEGIES FOR TEACHING INDIVIDUAL THEMES

It is recommended that teachers use the general planning model when preparing their strategies for each theme.

The followings steps should be taken:

(1) Analyze the course and the curriculum guide;
(2) Select and test the prototype to be constructed;
(3) Obtain the necessary instructional resources and materials;
(4) List objectives and content in order;
(5) Select and organize learning activities, teaching strategies, and evaluation procedures.

(1) Analyzing the course and the curriculum guide

In this step, teachers should acquaint themselves with the objectives to be achieved* and the content to be covered. They should also become familiar with the process followed in the design and production of a technical object and select suitable teaching strategies.

(2) Selecting and testing the prototype to be constructed

One of the first things to be done is to choose the prototype to be made, because all the subsequent steps will be based on this choice. The prototype should meet the following criteria:

- It should respond to a need and to pupils' interests;
- The function of the object should relate to the theme in question;
- By designing and producing it, pupils should be able to achieve the terminal objectives for the theme;
- The object should be one that is within the capacity of each pupil to make;
- The instructional resources and materials required to study the principles and to complete the construction should be available;
- Original ideas may be incorporated in its design.

---

* See the Planning and Evaluation Table following this section.

(3) Obtaining the necessary instructional resources and materials

This step should be completed as soon as a prototype has been chosen. The teacher should determine the tools and materials required for teaching purposes and for constructing the object.

(4) Listing objectives and learning content in order

The teacher should plan the sequence of steps to be followed in keeping with the objectives to be attained and the choice of prototype. He should decide how he will develop the theme to ensure that each objective is covered, in whole or in part, at the most suitable time. Some objectives may, for instance, be covered during specific phases, such as the Study of Principles phase, while others may be covered in a more general way over several phases.

(5) Selecting and organizing learning activities, teaching strategies, and evaluation procedures

Once the sequence of objectives and content has been established, the teacher should choose his strategies and decide how he will carry them out. To be valid, learning activities should be short, simple, and stimulating, and should enhance learning.

These activities should be presented at appropriate times and should be correlated in such a way that pupils will be constantly aware of the relationship between the design and the production of the technical object. The teacher should prepare strategies designed to achieve this goal.

In preparing strategies, the teacher should also prepare evaluation procedures and plan when these will be carried out.

(6) Making up, preparing, or obtaining instructional materials

As most strategies involve the use of instructional materials, teachers should make sure these are available when needed and that they are used correctly at the appropriate time.

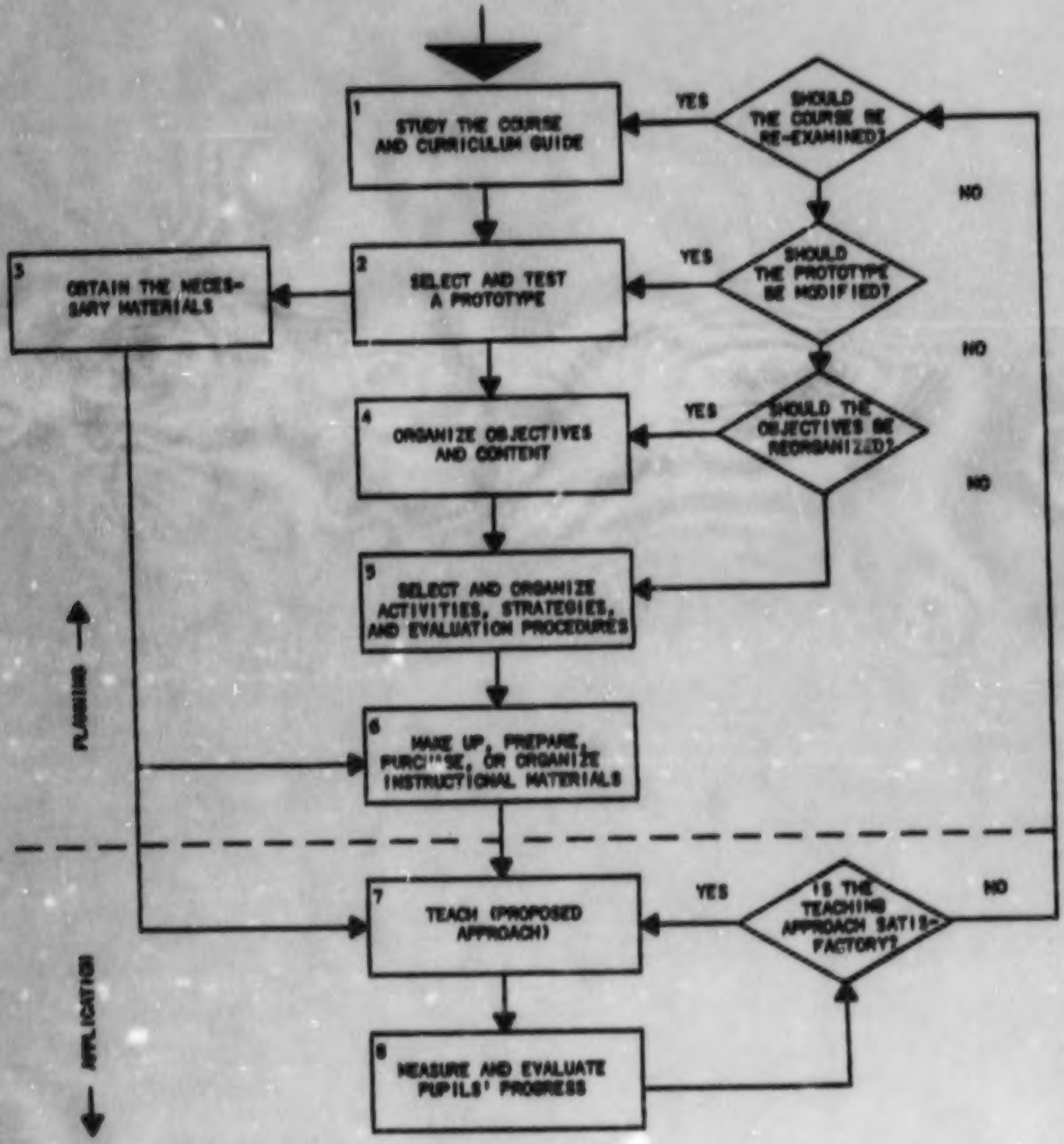
APPLYING THIS PLANNING PROCEDURE

When all the planning steps have been completed, teaching can begin. The final step is the evaluation of pupils' progress.

If pupils are progressing well, it can be assumed that the teaching strategies are valid and do not need to be modified. If the opposite is true, teachers should go back to the first planning step and review the process. It may not be necessary to change the whole unit: a change of prototype, a different sequence of objectives, or different activities and strategies may solve the problem.

The following chart shows the overall planning and evaluation process.

PLANNING AND EVALUATION PROCESS
FOR INTRODUCTION TO TECHNOLOGY


1 STUDY THE COURSE AND CURRICULUM GUIDE
2 SELECT AND TEST A PROTOTYPE
3 OBTAIN THE NECESSARY MATERIALS
4 ORGANIZE OBJECTIVES AND CONTENT
5 SELECT AND ORGANIZE ACTIVITIES, STRATEGIES, AND EVALUATION PROCEDURES
6 MAKE UP, PREPARE, PURCHASE, OR ORGANIZE INSTRUCTIONAL MATERIALS
7 TEACH (PROPOSED APPROACH)
8 MEASURE AND EVALUATE PUPILS' PROGRESS
SHOULD THE COURSE BE RE-EXAMINED?
SHOULD THE PROTOTYPE BE MODIFIED?
SHOULD THE OBJECTIVES BE REORGANIZED?
IS THE TEACHING APPROACH SATISFACTORY?
YES
YES
YES
YES
NO
NO
NO
NO
PLANNING
APPLICATION

[illegible]

CHAPTER 2

HOW TO USE CHAPTER 2

This chapter gives detailed information on each theme in the course. The first page (see the following example) gives the title, the number, and the time to be spent on the theme. The general objective of the theme is followed by the terminal objectives, a summary of the learning content, and a list of reference material. These charts are designed to give teachers an overview of the themes.

THEME 2

BUILDING/CONSTRUCTION TECHNOLOGY TIME: 1300 minutes

GENERAL OBJECTIVE: The pupil should be able to apply his knowledge of building and technical drawing by constructing an object which relates to this theme.

TERMINAL OBJECTIVES:

The pupil should be able:

2.1 To identify the principal types of buildings which are to be found in our modern communities.

2.2 To analyse briefly the component parts of residential buildings and describe their function, and to identify the principal materials which are used in their construction.

2.3 To identify static technical products (objects without movement) that we find in our environment. (Optional)

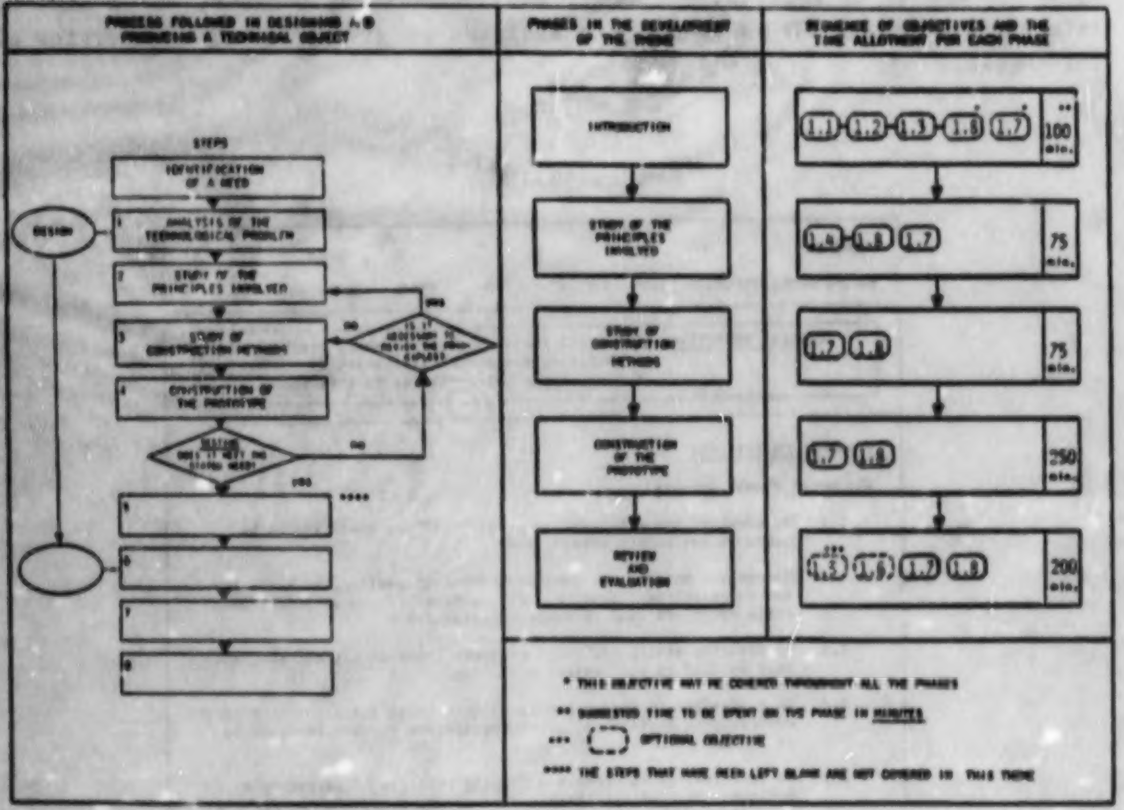
2.4 To design and to sketch simple objects using the principles of orthographic projection, using appropriate drawing instruments as listed.

2.5 To interpret or to execute a drawing to scale illustrating a building, part of a building, or a static object in the form of a model or full-scale.

LEARNING CONTENT:

Residential buildings: permanent, temporary—buildings: industrial, commercial—principal elements of a house—construction materials—static objects (optional)—orthographic projection—conventional use of lines—techniques for using drawing instruments—concept of working to scale—techniques: laying out, machining, shaping, assembling—safety rules for the workshop.

The chart on this page includes the design and production process, the phases in the development of the theme, and the sequence of terminal objectives for each phase of the theme.

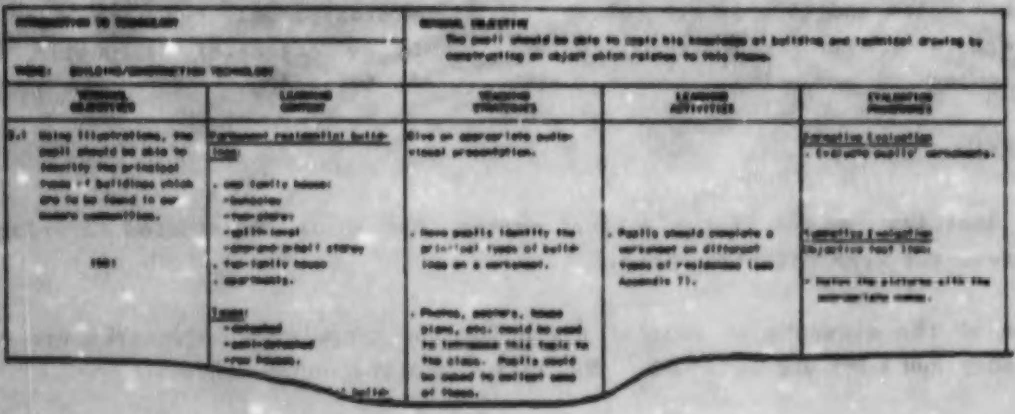

PROCESS FOLLOWED IN DESIGNING AND PRODUCING A TECHNICAL OBJECT
PHASES IN THE DEVELOPMENT OF THE THEME
SEQUENCE OF OBJECTIVES AND THE TIME ALLOTMENT FOR EACH PHASE
STEPS
IDENTIFICATION OF A NEED
DESIGN
1 ANALYSIS OF THE TECHNOLOGICAL PROBLEM
2 STUDY OF THE PRINCIPLES INVOLVED
3 STUDY OF CONSTRUCTION METHODS
4 CONSTRUCTION OF THE PROTOTYPE
TESTING DOES IT MEET THE STATED NEED?
IS IT NECESSARY TO REVISE THE PRINCIPLES?
YES
NO
NO
YES
5
6
7
8
****
INTRODUCTION
STUDY OF THE PRINCIPLES INVOLVED
STUDY OF CONSTRUCTION METHODS
CONSTRUCTION OF THE PROTOTYPE
REVIEW AND EVALUATION
1.1 1.2 1.3 1.8* 1.7*
** 100 min.
1.4 1.8 1.7
75 min.
1.7 1.8
75 min.
1.7 1.8
250 min.
*** 1.5 1.6 1.7 1.8
200 min.
* THIS OBJECTIVE MAY BE COVERED THROUGHOUT ALL THE PHASES
** SUGGESTED TIME TO BE SPENT ON THE PHASE IN MINUTES
*** OPTIONAL OBJECTIVE
**** THE STEPS THAT HAVE BEEN LEFT BLANK ARE NOT COVERED IN THIS THEME

This structure parallels the sequential order followed in the course and the phases in the development of the themes. Some objectives, particularly those dealing with the design of technical objects, appear in several phases (e.g., T.O. 1.8).

Objectives concerned with the design of an object are structured to correspond to the different phases in the development of the theme.

The teaching suggested for each phase takes into account the recommended time for each objective and includes time for formative evaluation. Summative evaluation should be carried out within the time set for the last phase in the development of the theme. This page should help teachers plan and match objectives with the different phases in the process of designing and producing the technical object.

The following pages (see the example below) present, in table form, the terminal objective, learning content, one or more teaching strategies, one or more learning activities, and evaluation procedures.



OBJECTIVES

The terminal objectives are more clearly defined in this guide than in the course, in that they include a condition.

Examples: WITHOUT USING REFERENCE MATERIALS, the pupil should...
USING TOOLS, the pupil should...

This should help teachers in planning lessons and in carrying out evaluation. In some instances, it is recommended that a group of objectives be covered simultaneously, as for example, the first four objectives in Theme 1.

In general, the terminal objectives and learning content are compulsory and the optional objectives are for enrichment. The latter should be covered if time permits and if they are relevant to the prototype selected. For example, Objective 4.9 on transmission of heat would be essential if pupils were designing and producing a heating unit. (Objective 4.10).

LEARNING CONTENT

The learning content is the subject matter that should be studied in order to achieve the terminal objectives.

Some of the elements of content given for the compulsory objectives are compulsory and some are optional. The latter are for enrichment.

TEACHING STRATEGIES

The suggested teaching strategies are designed to help pupils achieve the objectives. The strategies are broken down into different steps. Suggested instructional approaches designed to help teachers with their planning are also included. It is left up to teachers to develop other strategies to suit their pupils' interests and aptitudes and to fit their individual circumstances.

LEARNING ACTIVITIES

The learning activities correspond to the teaching strategies. Other activities may be used, providing they enable pupils to achieve the same objectives.

EVALUATION

The guide suggests measurement procedures and instruments for formative and summative evaluation. The suggestions for formative evaluation have been lined up with the appropriate terminal objectives. The teacher can use criterion-referenced or norm-referenced interpretation to obtain the information required.

RESOURCE MATERIAL

A wide variety of reference materials is included at the end of each theme. A list of audiovisual distributors is given at the end of the guide.

APPENDICES

Throughout the tables, references are made to the appendices. These appendices are designed to serve as models for the activities. The handwritten parts of the models are the sections to be completed by pupils. Like the strategies and activities, these models are optional.

INTRODUCTION TO THE COURSE TIME: 100 minutes

GENERAL OBJECTIVE: The pupil should be able to explain the purpose of the Introduction to Technology course within the context of general education at the secondary level.

TERMINAL OBJECTIVES:

The pupil should be able:

0.1 To define briefly, but specifically, the nature of the Introduction to Technology course.

0.2 To explain the meaning of the general objectives of the course, and why they are important.

0.3 To establish the distinction between "technology," "technique," and "science," and show the relationship between them.

LEARNING CONTENT:

Introduction to Technology (definition)—themes--general objectives of the course--technology—technique--science.

INTRODUCTION TO TECHNOLOGY THEME: INTRODUCTION TO THE COURSE		GENERAL OBJECTIVE The pupil should be able to explain the purpose of the Introduction to Technology course within the context of general education at the secondary level.		
TERMINAL OBJECTIVES	**LEARNING CONTENT**	**TEACHING STRATEGIES**	**LEARNING ACTIVITIES**	**EVALUATION PROCEDURES**
0.1 In response to questions from the teacher, the pupil should be able to define briefly, but specifically, the nature of the Introduction to Technology course. (30)*	Introduction to Technology: A subject forming part of general education in which pupils develop different abilities through the study and application of the process that takes place between the identification of a need and the completion and use of a technical object which fills this need.	. Ask pupils questions to elicit personal definitions of the Introduction to Technology course. . Use appropriate audiovisual aids to elicit more specific definitions.	. Each pupil should find and write down a simple definition of the Introduction to Technology course. . Following the audiovisual presentation, pupils should reformulate their definitions, if necessary, either individually or in small groups.	Formative Evaluation* . Assess pupil's oral responses. . Evaluate their written work. Summative Evaluation** Different types of objective test items: - Using the list of words, fill in the blanks in the following definitions; - From the following definitions, choose the correct one.
	List of the themes of the course.	. Initiate discussion based on pupils' definitions and the audiovisual presentation, and give pupils a specific oral definition. . Give pupils a written definition and a list of course themes, and discuss these briefly.	. Question and answer session.	* Formative evaluation is used to check pupils' learning progress after one or more activities during the study of a theme. **Summative evaluation involves giving the pupil an examination on completion of a theme. It may also take place at the end of a term.
* Numbers placed under the objectives indicate the suggested number of minutes to be spent on each objective.				

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
0.2 In response to oral questions, the pupils should be able to explain the meaning of the general objectives of the course and why they are important. (30)	List of the general objectives of the course (see p. 14).	. Using transparencies, present each of the general objectives. . Give pupils a copy of the list of general objectives. . Using transparencies of classroom activities that correspond to the general objectives, have pupils try to identify each of the objectives. You should prepare your own transparencies.	. Pupils should note on a worksheet simple explanations that come up in the discussion. (See Appendix 1.)	Formative Evaluation Following the activity, ask questions of a number of pupils selected at random. Give groups of pupils different objectives in order to evaluate their understanding of the whole set of general objectives.
0.3 Without using written reference material, the pupil should be able to establish the distinction between "technology," "technique," and "science," and show the relationship between them. (30)	Definitions of: technology, technique, science. Teachers should consult up-to-date dictionaries to find appropriate definitions of these terms.	. Using the definitions, draw a diagram on the blackboard to show the relationship between the words. (See Appendix 2.) . Using a familiar object (e.g., a table), illustrate this relationship and correlate it with the diagram.	. Following a question and answer session, pupils should complete a worksheet by analyzing an object in terms of the diagram. (See Appendix 2.)	Formative Evaluation Evaluate pupils' worksheets. Summative Evaluation Objective test items: -for a given object, match descriptions with the words "technology," "technique," "science."

THEME 1

TECHNOLOGY IN THE LIFE OF MAN

TIME: 700 minutes

GENERAL OBJECTIVE: Through the safe use of certain elementary methods of construction, the pupil should be able to explain how technology modifies the environment and how it influences our way of living.

TERMINAL OBJECTIVES:

The pupil should be able:

1.1 To identify the basic needs of man.

1.2 To distinguish between objects found in nature and man-made (technical) objects.

1.3 To identify technical objects (products) which respond to basic needs of man and which can be found in our environment.

1.4 To establish the relationship between the technical product and its function, and between its function and the need which initially inspired its creation.

1.5 To place the technology of man in its historical perspective, to give a summary evaluation of the rhythm of development of inventions, and to identify some of the factors which influenced this rhythm. (Optional)

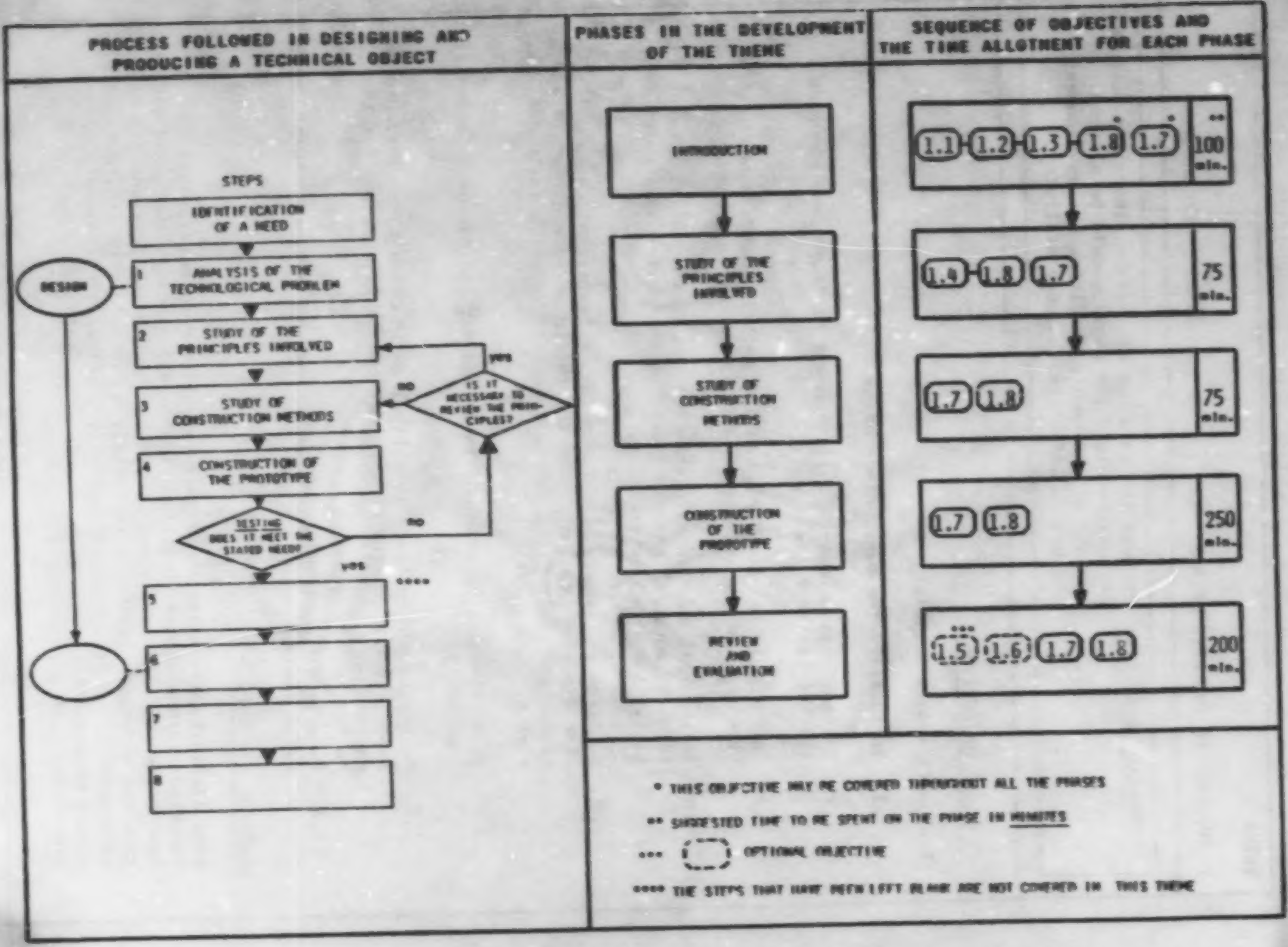
1.6 To distinguish between man as a consumer and man as a producer. (Optional)

1.7 To identify situations in daily life in which technology has an impact on the quality of life for the individual and for the environment.

1.8 To make a simple object which will answer one, or several, basic human needs.

LEARNING CONTENT:

Need (definition)--basic needs--natural object--technical object--function--technological inventions (optional)--factors that give rise to inventions (optional)--producer (optional)--consumer (optional)-- positive and negative effects of technology on life and the environment--old techniques of construction and assembly (optional)--elementary techniques of measuring, machining, assembling, laying out, forming--elementary safety rules for the workshop.


PROCESS FOLLOWED IN DESIGNING AND PRODUCING A TECHNICAL OBJECT
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SEQUENCE OF OBJECTIVES AND THE TIME ALLOTMENT FOR EACH PHASE
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IDENTIFICATION OF A NEED
DESIGN
1 ANALYSIS OF THE TECHNOLOGICAL PROBLEM
2 STUDY OF THE PRINCIPLES INVOLVED
3 STUDY OF CONSTRUCTION METHODS
4 CONSTRUCTION OF THE PROTOTYPE
TESTING DOES IT MEET THE STATED NEEDS?
yes
no
IS IT NECESSARY TO REVIEW THE PRINCIPLES?
yes
no
****
5
6
7
8
INTRODUCTION
STUDY OF THE PRINCIPLES INVOLVED
STUDY OF CONSTRUCTION METHODS
CONSTRUCTION OF THE PROTOTYPE
REVIEW AND EVALUATION
1.1 1.2 1.3 1.8* 1.7* ** 100 min.
1.4 1.8 1.7 75 min.
1.7 1.8 75 min.
1.7 1.8 250 min.
*** 1.5 1.6 1.7 1.8 200 min.

* THIS OBJECTIVE MAY BE COVERED THROUGHOUT ALL THE PHASES

** SUGGESTED TIME TO BE SPENT ON THE PHASE IN MINUTES

*** ⬚ OPTIONAL OBJECTIVE

**** THE STEPS THAT HAVE BEEN LEFT BLANK ARE NOT COVERED IN THIS THEME

INTRODUCTION TO TECHNOLOGY

THEME: TECHNOLOGY IN THE LIFE OF MAN

GENERAL OBJECTIVE

Through the safe use of certain elementary methods of construction, the pupil should be able to explain how technology modifies the environment and how it influences our way of living.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
1.1 Without using written reference material, the pupil should be able to identify the basic needs of man. (20)	Need: definition (using up-to-date dictionaries) Basic needs: -food -shelter -clothing -defense -transportation -communication.	It is recommended that the first four objectives be taught at the same time. . Have pupils name the objects around them. . List these objects in two columns on the blackboard, classifying them as natural or technical.	. Question and answer session.	Formative Evaluation . Assess pupils' oral responses. . Correct the worksheets. Summative Evaluation Different types of objective test items: - Without using reference material, name the five basic needs of man;
1.2 From a list of objects, the pupil should be able to distinguish between objects found in nature and man-made (technical) objects. (20)	Natural object: An object found in nature that has not been transformed by the efforts of man or animal. Technical object: An object made up of one or more parts arranged in a harmonious and functional way, which man designed and produced to meet one or more specific needs.	. Ask pupils why these objects have been classified. . Give accurate oral definitions of technical objects and natural objects. . Ask pupils the meaning of the word "need." . Have pupils identify the basic needs of man and then the technical objects which meet each of these needs. Write pupils' answers on the blackboard as they give them.		- From illustrations or a list of objects, identify the natural objects and the technical objects; - Match the following technical objects with the basic needs listed.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
1.3 Without using written reference material, the pupil should be able to identify technical objects (products which respond to basic needs of man, and which can be found in our environment). (20)	Basic needs (review) Different technical objects.			Formative Evaluation . Assess the worksheets. . Judge pupils' understanding from their oral responses. Summative Evaluation Objective test item: -Make a sentence by rearranging the following phrases. 1. leads to the creation 2. whose function 3. the need 4. is to make a line on paper 5. of a pencil 6. in order to meet the need.
1.4 Using simple objects, the pupil should be able to establish the relationship between the technical product and its function, and between its function and the need which initially inspired its creation. (20)	Function: Operation or characteristic role of the technical object or part of the technical object.	. Ask pupils the meaning of the word "function." . Discuss the relationship between the technical object, its function, and the need. . Show an appropriate film and ask pupils about its content.	. Pupils should complete a worksheet (see Appendix 3). . Question and answer discussion of the film.	

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
1.5 Using a list of inventions from different periods in history, the pupil should be able to place the technology of man in its historical perspective, to give a summary evaluation of the rhythm of development of the factors which influenced this rhythm. (Optional) (75)	Technological inventions: -hearth -early weapons(flint, bow) -shelter of branches -oil lamp -sewing needle -wheel -first boats -pottery -agriculture -first towns -printing -steam engine -incandescent lamp -combustion engine -telephone -radio -television -transistur -computer Factors which have given rise to inventions: -climatic changes -natural disasters -war -exploration -economic constraints	. Question pupils to find out how much they know of the subject. . Make a timeline by placing cardboard markers of the different periods in history on the classroom wall. . Have pupils research an invention of the past, draw it, and specify the period when it appeared. . After their research, have pupils put their drawings in the appropriate place on the wall. . Give pupils a sheet with a timeline on it and have them complete it during class. . They can add drawings of some of the inventions mentioned in the content. Select the best drawings and make a frieze of them to keep permanently in the classroom.	In a question and answer session, pupils should specify the principal technological inventions and the important periods in history. . Using reference material, pupils should carry out a research project outside of class. . Pupils should put their drawings of inventions near the appropriate marker on the wall. . Pupils should complete a worksheet by recording the main inventions on a timeline. . Question and answer session.	Formative Evaluation . Evaluate the results of the pupils' research project. . Judge pupils' understanding by assessing their questions and ideas. Summative Evaluation Different types of objective test items: - Match inventions with their respective periods; - Classify the following list of inventions into 3 main categories: very old, old, modern.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
		. Explain some of the factors, including cultural ones, which explain the increase and decrease in the numbers of inventions through the years.		
1.6 Using situations in everyday life, the pupil should be able to distinguish between man as a consumer and man as a producer. (Optional) (30)	Producer: Person who produces goods or provides services. Consumer: Person who uses goods to satisfy his needs.	. Ask pupils to define a consumer and a producer. . Have them give examples. . Ask them questions designed to encourage them to think about the subject. . Give pupils a worksheet on the subject and discuss it with them.	. Question and answer session. . Pupils should identify illustrations of consumption and production on a worksheet. . The worksheet can be started in class and completed as homework.	Formative Evaluation . Evaluate pupils' worksheets. Summative Evaluation Objective test item: - Identify illustrations of consumption and production.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
1.7 Without using written reference material, the pupil should be able to identify situations in daily life in which technology has an impact on the quality of life for the individual and for the environment. (75)	Positive and negative effects of technology on life and the environment: -water -air -earth -health -life expectancy -plant and animal life -beauty of surroundings -work, family, and social life.	This objective should be introduced at the beginning of the theme and briefly covered in several subsequent periods. . Have pupils do a project that involves finding a newspaper or magazine article or illustration on the topic under study. . Ask several pupils to discuss the information collected. . Pin the information up on a notice board.	. Pupils should research one or more articles or illustrations. . Pupils should give an oral report on their research.	Formative Evaluation . Evaluate pupils' efforts and their findings. . Evaluate their oral presentations. Summative Evaluation Short-answer test item: - Using a list of situations in which technology has played a role, indicate whether this role has had a positive or negative effect on life and the environment.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
1.8 Using simple drawings and elementary tools, the pupil should be able to make a simple object which will answer one, or several, basic human needs. (250)	Basic needs (review). Old techniques of construction and assembly (optional): -shaping with hammer and chisel -wedging -joining -pegging. Elementary techniques: -measuring -machining -assembling -laying out -forming. Elementary safety rules for the workshop.	. Present the object to be made and give reasons for the choice. . The chosen object could be: -a simple object in every-day use; -a simple object that involves the use of old techniques; -a mock-up that represents a scene from life in the past. . Do a brief study with pupils of the principles involved, without going through the whole design and construction process. . Give pupils good pictorial drawings of the object they are to make and have them read them. . Give pupils simple production and assembly specifications.	- In a question and answer session, pupils should identify the principles on which the object to be made is based. . In a question and answer session, pupils should interpret the drawings of the object. . In a question and answer session, pupils should interpret the production and assembly specifications (see Appendices 4 and 5).	Formative Evaluation . Assess pupils' responses. . Evaluate their projects using an evaluation sheet with a list of specific behaviours for observation. (See Appendix 6) Summative Evaluation Different types of objective test items: - In a pictorial drawing, identify dimensions, forms, etc. - By means of "true" or "false" answers, identify the elementary safety rules for the workshop.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
		. Identify the tools that will be used and demonstrate how to use them safely. . It is recommended that pupils gather around the demonstration table to watch the demonstrations.	. Pupils should observe and take part in demonstrations of construction and assembly techniques and safe use of tools.	
		. Explain to pupils the basic safety rules to follow in the workshop. . Make sure pupils employ the correct techniques for using tools. Construction of objects, using elementary tools, should be done exclusively in class to ensure that pupils follow correct procedures. The basic materials used in making the objects should be provided by the school. It is recommended that one object be made by each pupil. It is possible however to have pupils work in pairs. It is not advisable to have groups of more than two for this type of activity.	. Pupils should use tools properly and safely in constructing a simple object or model.	

THEME I: TECHNOLOGY IN THE LIFE OF MAN

REFERENCE MATERIALS		THEMES				
MONOGRAPHS	**Remarks**	1	2	3	4	5
Bame, E. Allen and Paul Cummings. Exploring Technology. Worcester, Mass.: Davis Publications Inc., 1980.	See Chapter 1 What is Technology? pp. 1-31.	x				
Boorstin, Daniel J. The Discoverers - A History of Man's Search to Know His World and Himself. New York: Vintage Books, 1985.	Good reference for the history of technology.	x				
Burke, James. Connections. Toronto: Macmillan Company of Canada, 1978.	Excellent source book which follows the BBC series (10 TV programs).	1.5*				
Burke, James. The Day the Universe Changed. London: British Broadcasting Corporation, 1985.	Excellent reference book for the history of technology. Available in Canada through Macmillan Company of Canada, Toronto.	1.5				
Cavendish, Marshall. The Marshall Cavendish Encyclopedia of Science and the Future. Volume 4, Technology Tomorrow. Freeport, Newport: Marshall Cavendish Corporation, 1982.	Freeport, Newport; Marshall Cavendish Corporation, 1982. General reference	x				
Fales, J., E. Sheets, G. Merwich, and J. Dinan. Manufacturing: A Basic Text for Industrial Arts. Bloomington, Ill.: McKnight Publishing Co., 1980.	Designing and producing a technical object. Methodology.	x				
Gradwell, John, Malcolm Welch, and Jean-François Vincent. Techno 2000, An Introduction to Technology. Toronto: Copp Clark Pitman Ltd., 1986.	See Chapter 1 Technology in our Lives.	x				
Gimpel, Jean. The Medieval Machine: The Industrial Revolution of the Middle Ages. New York: Penguin, 1977.	Excellent source book for project ideas. Very entertaining and instructive.	x				

* Two-digit numbers identify specific terminal objectives.

THEME I: TECHNOLOGY IN THE LIFE OF MAN

		THEMES				
MONOGRAPHS	Remarks	1	2	3	4	5
Hodges, Henry. *Technology in the Ancient World.* New York: Alfred A. Knopf, 1970.	See Chapter 1 Good ideas for projects on the development of early technology.	x				
Kreuzberg, Michael and C. W. Pursell. *Technology in Western Civilization.* Toronto: Oxford University Press, 1967.	Reference text on the history of technology.	x				
Lindbeck, J. R. *Designing Today's Manufactured Products.* Bloomington, Illinois: McKnight and McKnight, 1972.	Designing and producing a technical object.	x				
Mathé, J. *Leonardo's Inventions.* New York: Crescent Books, 1980.	General reference for project ideas. Note: available through W. H. Smith.	x				
Sprague de Camp, L. *The Ancient Engineers.* New York: Ballantine Books, 1963.	Good reference books which contain a number of ideas for project work.	x				

THEME 1: TECHNOLOGY IN THE LIFE OF MAN

		THEMES				
AUDIOVISUAL	**Description**	1	2	3	4	5
Automation: Automation: What is it? Science and Automation Automation and Society Automation and Your Career Carman Educational Associates Limited	Complete series of 10 film-strips.	1,7				
Connections: A 10-program TV series produced by the BBC. Written and presented by James Burke. In this series the author traces the technological changes that have taken place through the history of mankind: one invention or technological innovation triggers a series of other inventions, leading to present-day technology. Teachers can use this series to provide an introduction to the history of technology. They may also find it a useful source of project ideas for their students. Each program is independent of the others and corresponds to one of the chapters of James Burke's book, Connections. Teachers can select the program that meets their needs by consulting the book or by reviewing the individual programs. 1. The Trigger Effect 2. Death in the Morning 3. Distant Voices 4. Faith in Numbers 5. The Wheel of Fortune 6. Thunder in the Skies 7. The Long Chain 8. Eat, Drink and Be Merry 9. Lighting the Way 10. Inventing the Future BBC Television Distributors	A series of 10 TV programs produced by the BBC. Each program is 60 min. long and in colour.	x				

THEME I: TECHNOLOGY IN THE LIFE OF MAN

		THEMES				
AUDIOVISUAL	**Description**	1	2	3	4	5
The Discoverers A documentary dealing with several scientific discoveries and techniques and their implications for the future of mankind. The following are examined: laser technology, the fuel cell, urethane foam (plastic), petrochemicals, cross-pollination of technologies, jet-piercing drills and micro-circuitry. United States Information Agency, 1969 Canadian Film Institute (The National Science Film Library)	18 minutes, colour	1.5				5.6
The Future This program explores our growing relationships with communication technologies such as interactive computers, cable television and video discs. Futurologist Peter Swartz shows the effect of this new form of media on the way we live, work, and play. Marlin Motion Pictures	28 minutes, colour	1.7				
The Future of Alternative Technology This film presents an overall view of alternative technology and discusses its desirability and implications. International Tele Film Enterprises	Cat. No. 7262/11, black and white	1.7				
Future Shock Based on Future Shock by Alvin Toffler, this film provides a jarring look at the world's fast-approaching superelectronic future: artificial men, thinking machines, genetic engineering, and the startling implications these may hold for mankind. McGraw-Hill Films Limited	60 minutes, colour	1.7				

THEME I: TECHNOLOGY IN THE LIFE OF MAN

		THEMES				
AUDIOVISUAL	**Description**	1	2	3	4	5
Humanizing the Technology Computers and robots programmed to accept instructions are now so advanced that they can act in a virtually human manner. TV Ontario	BPN 166405 30 minutes, video	1,7				
The Information Flow Deals with the enormous new flow of information available through TV cables, fibre optics, and telephone interconnections. TV Ontario	BPN 166407 30 minutes, video	1,7				
Inventors of Thingumajigs This film is dedicated to a very special breed of people whose unusual ideas suffer occasional setbacks. Whatever the invention - combcleaner, panty-hose. snowmobile - these "inventors of thingumajigs" are a valuable natural resource who contribute much to society. National Film Board of Canada	55 minutes, colour 106C 0175 086	1,5				
Leonardo da Vinci Depicts in detail the work of Leonardo da Vinci, one of the greatest engineers and scientists of all time, who, more than five hundred years ago, invented and designed many things that even today are considered ultra modern. General information. Pictoria Films, Italy Canadian Film Institute	70 minutes, colour, 1953	1,5				
Lost Notebooks of Leonardo Sources hidden for centuries reveal a new view of the genius of Leornado da Vinci - artist, engineer, scientist, and one of the early inventors of the modern age. Canadian Broadcasting Corporation	60 minutes, colour	1,5				

THEME I: TECHNOLOGY IN THE LIFE OF MAN

		THEMES				
AUDIOVISUAL	Description	1	2	3	4	5
The Microprocesser Revolution The role of the microprocessing chip in revolutionizing information processing, storage, and technology ranging from toys to complex computers. TV Ontario	BPN 166401 30 minutes, video	1.7				
New Perspectives This program demonstrates what can be seen when we allow machines to supplement our eyesight. Weather satellites and electronic microscopes go where we cannot and literally open new horizons. TV Ontario	BPN 166408 30 minutes, video	1.7				
Technological Development Examines the role technology has played in American business and shows how competition spurs constant search for better products and processes. General Information. Canadian Film Institute	30 minutes, black and white, 1963	1.7				
Technology Utilization This film, produced by NASA, provides several examples of the commercial applications of technology that was originally developed to meet the needs of the space program. Canadian Film Institute	27 minutes, colour, 1970	1.7				
The Third Wave This documentary about technological change and its radical impact upon our lives represents Alvin Toffler's vision of the future. TV Ontario	90 minutes, colour, video BPN 205114	1.7				

THEME 1: TECHNOLOGY IN THE LIFE OF MAN

		THEMES				
AUDIOVISUAL	**Description**	1	2	3	4	5
This Is My Invention A film that explains the patent system and demonstrates the importance of patents and inventions to the Canadian Industry and economy. Crawley Films Limited, Canada Canadian Film Institute	22 minutes, colour, 1967	1.5				
Tomorrow Begins Today The effect of new technology on our lives. The use of computers, new ideas about housing and traffic problems and how education must adapt to help prepare people for the "third industrial revolution." Greenpark Productions, United Kingdom Canadian Film Institute	24 minutes, colour, 1968	1.7				
Towards the Ultimate System This program shows how information reaches consumers instantly through computer, telephone, and television technology. TV Ontario	BPN 166402 30 minutes, colour, video	1.7				

THEME 2

BUILDING/CONSTRUCTION TECHNOLOGY TIME: 1300 minutes

GENERAL OBJECTIVE: The pupil should be able to apply his knowledge of building and technical drawing by constructing an object which relates to this theme.

TERMINAL OBJECTIVES:

The pupil should be able:

2.1 To identify the principal types of buildings which are to be found in our modern communities.

2.2 To analyze briefly the component parts of residential buildings and describe their function, and to identify the principal materials which are used in their construction.

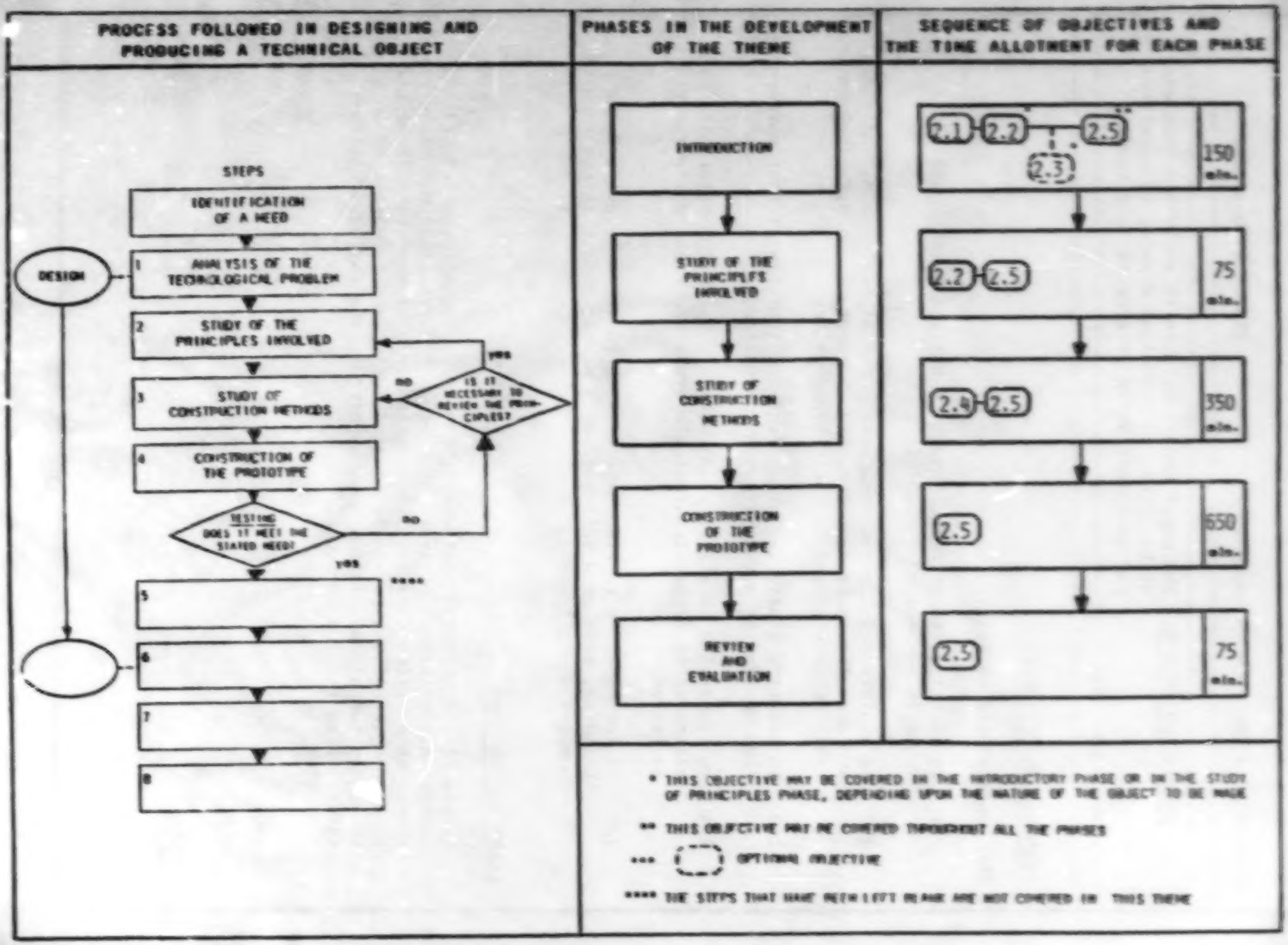
2.3 To identify static technical products (objects without movement) that we find in our environment. (Optional)

2.4 To design and to sketch simple objects using the principles of orthographic projection, using appropriate drawing instruments as listed.

2.5 To interpret or to execute a drawing to scale illustrating a building, part of a building, or a static object in the form of a model or full-scale.

LEARNING CONTENT:

Residential buildings: permanent, temporary--buildings: industrial, commercial--principal elements of a house--construction materials--static objects (optional)--orthographic projection--conventional use of lines--techniques for using drawing instruments--concept of working to scale--techniques: laying out, machining, shaping, assembling--safety rules for the workshop.


PROCESS FOLLOWED IN DESIGNING AND PRODUCING A TECHNICAL OBJECT
PHASES IN THE DEVELOPMENT OF THE THEME
SEQUENCE OF OBJECTIVES AND THE TIME ALLOTMENT FOR EACH PHASE
STEPS
IDENTIFICATION OF A NEED
DESIGN
1 ANALYSIS OF THE TECHNOLOGICAL PROBLEM
2 STUDY OF THE PRINCIPLES INVOLVED
3 STUDY OF CONSTRUCTION METHODS
4 CONSTRUCTION OF THE PROTOTYPE
TESTING DOES IT MEET THE STATED NEED?
yes
no
IS IT NECESSARY TO REVIEW THE PRINCIPLES?
yes
no
****
5
6
7
8
INTRODUCTION
STUDY OF THE PRINCIPLES INVOLVED
STUDY OF CONSTRUCTION METHODS
CONSTRUCTION OF THE PROTOTYPE
REVIEW AND EVALUATION
2.1
2.2
*
2.5
**
2.3
***
150 min.
2.2
2.5
75 min.
2.4
2.5
350 min.
2.5
650 min.
2.5
75 min.

* THIS OBJECTIVE MAY BE COVERED IN THE INTRODUCTORY PHASE OR IN THE STUDY OF PRINCIPLES PHASE, DEPENDING UPON THE NATURE OF THE OBJECT TO BE MADE

** THIS OBJECTIVE MAY BE COVERED THROUGHOUT ALL THE PHASES

*** ( ) OPTIONAL OBJECTIVE

**** THE STEPS THAT HAVE BEEN LEFT BLANK ARE NOT COVERED IN THIS THEME

INTRODUCTION TO TECHNOLOGY

THEME: BUILDING/CONSTRUCTION TECHNOLOGY

GENERAL OBJECTIVE

The pupil should be able to apply his knowledge of building and technical drawing by constructing an object which relates to this theme.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
2.1 Using illustrations, the pupil should be able to identify the principal types of buildings which are to be found in our modern communities. (50)	Permanent residential buildings: . one family house: -bungalow -two-storey -split-level -one-and-a-half storey . two-family house . apartments. Types: -detached -semi-detached -row houses. Temporary residential buildings: -country cottage -trailer -mobile home -tent-trailer -houseboat. Industrial buildings: -workshop -factory -warehouse -plant -mill -grain elevator.	Give an appropriate audio-visual presentation. . Have pupils identify the principal types of buildings on a worksheet. . Photos, posters, house plans, etc. could be used to introduce this topic to the class. Pupils could be asked to collect some of these.	. Pupils should complete a worksheet on different types of residences (see Appendix 7).	Formative Evaluation . Evaluate pupils' worksheets. Summative Evaluation Objective test item: - Match the pictures with the appropriate names. Note A reminder to the teacher that summative evaluation takes the form of an examination given on completion of a theme and/or at the end of a term.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
	Service buildings: -hospital -station (police and fire) -school -church. Commercial buildings: -store -shopping centre -garage -office building -market -bank.			

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
2.2 Using an illustration or a mock-up, the pupil should be able to analyze briefly the component parts of residential buildings and describe their function, and to identify the principal materials which are used in their construction. (75)	Principal elements: .foundation. -footing -wall -drainage system .floor: -joists -beams -sub-floor -floor finish .wall: -exterior finish -air space -studs .ceiling: -joists -insulation -vapour barrier -interior finish .roof: -rafters -exterior coverings -exterior finish. Materials: -concrete -wood -steel -aluminum -mineral wool -tar paper -plasterboard -asphalt paper	. Use pictures of the different parts of the structure of a house, and a transparency of these pictures, to identify the principal elements, their functions, and the materials used in making them. It is a good idea to show pupils samples of the main materials used in building. These samples could be mounted on a panel. A mock-up would help pupils understand these concepts.	. After a question and answer session, pupils should complete a worksheet, filling in the names of the elements, their functions, and the materials used (see Appendix 8).	Formative Evaluation . Evaluate pupils' worksheets. Summative Evaluation Objective test item: - Examine the following pictures and identify the elements, their functions, and the materials used.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
	-ceramic -brick -linoleum -plastic -fibre board.			
2.3 Without using written reference material, the pupil should be able to identify static technical products (objects without movement) that we find in our environment. (Optional)	Subject to forces that do not create movement.	. Explain the difference between "static" and "dynamic."		Formative Evaluation . Assess pupils' responses. . Evaluate pupils' workbook assignments.
	Dynamic: Subject to forces that cause movement.	. Explain the similarity between buildings and static objects around us.	. Question and answer session.	
(15)	Static technical objects.	. By means of questions, have pupils identify objects which do not include a mechanism.	. Pupils should make a list of different static objects in their workbooks.	Summative Evaluation Objective test item: - In the following list of objects or pictures, identify those which are static.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
2.4 From pictorial drawings, the pupil should be able to design and to sketch simple objects applying the principles of orthographic projection and using appropriate drawing instruments as listed. (300)	Orthographic projection: -six views -essential views -length -width -height.	. Copy a pictorial drawing of a simple object (such as a cube) on the blackboard and have pupils identify the advantages and disadvantages of this type of drawing.		Formative Evaluation . Assess the extent of pupils' understanding of the topic by means of questions. . Evaluate their worksheets. . Check pupils' techniques in using instruments.
	Conventional use of lines: -continuous -broken lines (dotted) -centre lines -dimension lines.	. Introduce the concept of projection on a plane and give pupils the necessary information to draw a cube.	. Pupils should draw a cube on squared paper or light cardboard.	Summative Evaluation Different types of objective test items:
	Techniques for using: -a drawing board -a T-square -set squares (45°, 30°/60°) -a compass.	. Give an appropriate audio-visual presentation.		
		. Using a transparent cube and a rectangular block, demonstrate the position of the views used in orthographic projection and name them. It is suggested that teachers colour the surfaces of the blocks, using a different colour for each type of plane (profile, vertical, horizontal).	. Pupils should observe the demonstration and discuss it in a question and answer session. . Following the demonstration, pupils should complete a worksheet (see Appendix 9).	-In different pictorial drawings, identify the orthographic projection; -Complete a given number of views, -Identify given dimensions on a drawing (length, width, height); -Match names with different lines; -In the following illustrations identify the correct techniques for using instruments.
		. Introduce drawing instruments and demonstrate how they are used.	. Pupils should observe the demonstration.	

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
		. Give pupils the necessary information to draw a variety of simple objects. . A pictorial drawing of each object should be made on the drawing sheet. The different views should be identified on the sheet. . It is a good idea to have a wood or styrofoam model of each of the objects to be drawn. . Explain the alphabet of lines as needed (for the objects in question). . Explain the difference between a drawing made with instruments and a sketch.	. Pupils should use drawing instruments to draw a number of geometric figures (square, triangle, circle) and then simple objects (e.g., notched, tiered, grooved, perforated objects)	
		. Explain some of the techniques for making sketches. . Pupils can be given sketches to do as homework. Reference Material Jensen, C., F. Mason. Drafting Fundamentals. Toronto: McGraw-Hill Ryerson Ltd., 1982.	. Pupils should make a few simple sketches.	

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
2.5 Using data, the pupil should be able to interpret or to execute a drawing to scale illustrating a building, part of a building, or a static object in the form of a model or full-scale. (750)	Concepts of working to scale. Techniques of measurement, laying out, machining, shaping and assembling: -use of ruler -use of square -cutting -shaping -drilling -sanding -screwing -bending -gluing -nailing. Safety rules for the workshop.	Have pupils follow the steps from design to completion of the object without detailing the different steps. These will be explained in depth in the next theme. . From a defined need, go on to the study of principles and of construction of an object. This object should be studied and tested beforehand by the teacher. The pre-tested product can be improved upon by suggestions from pupils. . Have pupils draw part or all of the product to be made, in the form of a pictorial drawing, sketch, or diagram. OR . Using a drawing of the object, have pupils interpret the information needed to make the object.	. Each pupil should write down the principles. . Some of these should be selected and put on the blackboard and pupils should discuss and analyze them. . Pupils should write down those which are selected. . In a question and answer session, pupils should determine the method for constructing the object. . They should sketch or draw the object to be made. OR . Pupils should interpret the drawings in a question and answer session.	Formative Evaluation . Evaluate pupils' individual research. . Assess pupils' responses. . Evaluate their drawings. . Evaluate their worksheets. . Evaluate their work on specifications. . Evaluate the completed product according to specific criteria. (See the evaluation sheet in Appendix 6.) Summative Evaluation Different types of objective test items: - In the following drawings to different scales, put in given dimensions; - In the following drawings, identify dimensions, forms, and positions;

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
		. Using a simple object and three drawings of this object (enlarged, full scale, reduced), introduce pupils to concepts of scale through comparison.	. In a question and answer session, pupils should note ways of indicating scale on a worksheet.	
		. Using transparencies or the blackboard, have pupils complete the construction and assembly specifications.	. Pupils should complete the production specifications. (See Appendix 4.)	- Using construction and assembly specifications, identify the sequence of operations, the materials required, and the tools needed for the different operations.
		. Using the production specifications, demonstrate each step, explaining the techniques and safe handling of tools.	. Pupils should observe and take part in the demonstrations. . Using the construction and assembly specifications, pupils should construct and assemble each part of the object.	- From among the following statements choose the one which describes the safe handling of a tool.

THEME 2: BUILDING/CONSTRUCTION TECHNOLOGY

REFERENCE MATERIALS		THEMES				
MONOGRAPHS	**Remarks**	1	2	3	4	5
Canada Mortgage and Housing Corp. A Selection of House Designs for Classroom Use. Ottawa: CMHC, 1968.			2.1			
Canada Mortgage and Housing Corp. A Glossary of House-Building and Site Development Terms. Ottawa: CMHC, 1982.			2.1			
Canada Mortgage and Housing Corp. Canadian Wood-Frame House Construction. Ottawa: CMHC, 1981.			2.1			
Canada Mortgage and Housing Corp. Modest House Designs. Ottawa: CMHC, 1977.			2.1			
Canada Mortgage and Housing Corp. Residential Standards Canada 1980. Ottawa: CMHC, 1980.			2.1			
Gies, Joseph. Bridges and Men. Garden City, N.Y.: Doubleday, 1963.						
Gradwell, John, Malcolm Welch, and Jean-François Vincent. Techno 2000: An Introduction to Technology. Toronto: Copp Clark Pitman Ltd., 1986.	See Chapter 2 Structures: Building and Construction Technologies.		2.1 2.2 2.4 2.5			
Hepler, Donald E. and Paul I. Wallach. Architecture: Drafting and Design. 4th edition. Montréal: McGraw-Hill Book Co., 1982.	Intro. - See Section 1: Fundamentals of Designing. Section 8: Elevation Drawings. Unit 35 - Elevation Design. Unit 36 - Elevation Projection. Section 9: Pictorial Drawings.		2.1 2.5			

THEME 2: BUILDING/CONSTRUCTION TECHNOLOGY

		THEMES				
MONOGRAPHS	Remarks	1	2	3	4	5
Jacobs, David and Anthony Neville. Bridges, Canals and Tunnels. New York: American Heritage, 1968.						
Jensen, Cecil. Architectural Drawing and Design for Residential Construction. Montréal: McGraw-Hill Ryerson Ltd., 1982.	See Chapter 2: The Needs of the People. Unit 2-1: Trends in Modern Living. Unit 2-3: Types of Housing Unit 2-4: Selecting a House Style.		2.1			
	See Ch. 7: Unit 7-1 to 7-6: Presentation Drawings See Chapter 8: Architectural Models.		2.5			
Jensen, Cecil and Fred Mason. Drafting Fundamentals. 5th Edition. Montréal: McGraw-Hill Ryerson, 1982.	See Chapter 15: Architectural Drafting.		2.1 2.2			
	Chapter 2: Developing Drafting Skills. Chapter 3: Theory of Shape Description. Ch. 4: Basic Dimensioning.		2.4			
	Ch. 9: Pictorial Drawings.		2.5			
Kicklighter, Clois E. and Ronald J. Baird. Architecture: Residential Drawing and Design. South Holland, Ill.: The Goodheart-Willcox Company Inc., 1984.	See Chapter 1: The World of Architecture. Ch. 2: Basic House Design.		2.1			
	Ch. 25: Presentation Drawings Ch. 26: Architectural Models.		2.5			

THEME 2: BUILDING/CONSTRUCTION TECHNOLOGY

		THEMES				
MONOGRAPHS	Remarks	1	2	3	4	5
Knowlton, Kenneth W., Robert A. Beauchemin and Patrick J. Quinn. Technical Freehand Drawing and Sketching. Montréal: McGraw-Hill Book Co., 1977.	Reference book. Numerous exercises and well-explained techniques for classroom use.		2.4			
Lux, D. G., W. E. Ray, E. K. Blakenbaker, and W. Umstattd. World of Construction. Bloomington, Illinois: McKnight Publishing Company, 1982.			2.5			
Lux, D. G., W. E. Ray, and A. D. Maustein. World of Construction. Bloomington, Illinois: McKnight Publishing Company, 1970.	- World of Construction Laboratory Manual. - World of Construction Teacher's Guide.		2.5			
School Council Modular Courses in Technology. Structures. Edinburgh: Oliver and Boyd, 1980.	General information for enrichment.					
Stirling, Norman. Introduction to Technical Drawing. Toronto: Macmillan Company of Canada, 1977.	See Chapter 20: Architectural Drawing.		2.1 2.2			
	Ch. 2: Basic Instruments and Equipment. Ch. 4: Orthographic Drawing Non-Cylindrical Objects. Ch. 5: Dimensioning Non-Cylindrical Objects.		2.4			
	Ch. 19: Pictorial Drawing. Ch. 20: Architectural Drawing.		2.5			

THEME 2: BUILDING/CONSTRUCTION TECHNOLOGY

		THEMES				
MONOGRAPHS	**Remarks**	1	2	3	4	5
Walker, Les and Jeff Milstein. Designing Houses: An Illustrated Guide to Building Your Own Home. Woodstock, New York: The Overlook Press, 1979.	Excellent book for house modelling.		2.2			
Wallach, Paul I. The Basic Book of Drafting. Alsip, Illinois: American Technical Publishers, Inc., 1979.	Very good booklet written for high school curricula. Well presented - useful as a pupil's source book.		2.4			
Weitzman, D. Windmills, Bridges, and Old Machines. New York: Charles Scribner's and Sons, 1982.			2.5			

THEME 2: BUILDING/CONSTRUCTION TECHNOLOGY

		THEMES				
AUDIOVISUAL	Description	1	2	3	4	5
A World of Structures An introduction to the world of structures. An overview of the mechanics of structures and their materials is given through actual on-site examples. Featured are the Leaning Tower of Pisa, Venice, the dome of St. Peter's Basilica, the Eiffel Tower and the Golden Gate Bridge. Robert A. Heller, Virginia Polytechnic Institute, 1973 McGraw-Hill Films Limited	Code 075094-7 20 minutes, colour		2.1			
By Design A film to make people aware of industrial design as well as its function in industrial innovations. Canadian Film Institute	Colour, 20 minutes		2.4	3.9		
The Building Game A down-to-earth film explaining the interrelationships of people, materials, tools, and machines in the building process. Netherlands, 1963 Canadian Film Institute	Netherlands, 1963, 20 minutes, colour, English		2.1 2.2			
Constructors An introduction to the field of construction engineering illustrated by examples of highways, bridges, office buildings, defense plants, and missile installations under construction. Visual Media Resources Audiovisual Department	17 minutes, black and white, BRI/AGCON CAV 755		2.1			
Drafting 1. Introduction to Drafting - discusses the principles and purposes of drafting, gives a brief history of the field and shows the elements of a blueprint. 2. Drafting Techniques - examines the instruments needed and the techniques used. Computerized drafting aids and reproduction methods are discussed.	Cat. No. MX01201 Set 3cas/3strips MX120D Disk. Apple 48K MXV120, video edition		2.4			

THEME 2: BUILDING/CONSTRUCTION TECHNOLOGY

		THEMES				
AUDIOVISUAL	**Description**	1	2	3	4	5
Drafting (continued) 3. Careers in Drafting - explores the nature of the work in various industries and the skills required for each application. Note: An optional computer diskette gives students practical experience by introducing simple computer drafting. Do-it-yourself exercises take the student step-by-step through the problems. Teacher's guide available. School Services of Canada	Cat. No. MX01201 Set 3cas/3strips MX12CD Disk. Apple 48K MXV120, video edition		2.4			
The Forth Road Bridge The film explains the engineering problems and the principles of bridge design in the construction of the longest suspension bridge in Europe, the Firth of Forth bridge. Shell Mex and B.P. Limited, Random, 1964 Canadian Film Institute	Video 53 minutes, colour, 1964		2.1 2.5			
Founded on Science Civil engineering and building problems posed by architects and engineers are studied by British scientists in specially equipped laboratories. The Wimpey Organization, World Wide Canadian Film Institute	Colour, 1966		2.1 2.2			
Shaping Tomorrow's Landmarks This film acquaints the viewer with the design and structural possibilities of stainless steel in the construction of today's buildings. Caldwell Queensway Production for Atlas Steel Inc. and International Nickel Company of Canada, 1965. Canadian Film Institute	Canada, 1965, 18 minutes, colour,		2.2			

THEME 2: BUILDING/CONSTRUCTION TECHNOLOGY

		THEMES				
AUDIOVISUAL	**Description**	1	2	3	4	5
Shop Safety Intermediate - Secondary This sound filmstrip set with teacher's guide gives many pointers on safety, and demonstrates correct ways of using various hand and machine tools. Particular attention is paid to protecting the eyes and hands around cutting and burning tools. 1. Think Safety 2. General Shop Hazards 3. Hand Saws, Chisels and Files 4. Screwdrivers, Wrenches, Sheet Metal and Welding 5. Grinders, Routers, Power Saws and Jointers 6. Drill Presses and Lathes School Services of Canada	ML0002 Set 6cas/6strips ML1022 Set French Version		x	x		
The Slender Span The building of the new 5240-foot-long suspension bridge over the River Severn to improve communication between England and South Wales. British Government Offices in Canada Canadian Film Institute	Colour, 1966		2.1 2.5			
Stainless Steel in Architecture Allan Jarvis, former director of the National Gallery of Canada, narrates the story of stainless steel as a building material. General Information Crawley Films Ltd. for Union Carbide Canada Limited Canadian Film Institute	Canada, 1961, 22 minutes, colour, English		2.2	3.4		

THEME 3

MECHANICAL TECHNOLOGY TIME: 1500 minutes

GENERAL OBJECTIVE: The pupil should be capable of following a logical step-by-step procedure in the design and completion of a mechanical product or object.

TERMINAL OBJECTIVES:

The pupil should be able:

3.1 To identify certain objects which have a mechanical movement; objects which one finds in the home, in recreational activities, in the area of transportation, etc.

3.2 To state, in a logical sequence, the principal steps in the design and construction of a technical object to meet a specific need.

3.3 To identify, interpret, and execute four (4) types of technological diagrams.

3.4 To identify and to list the principal properties of the materials listed under learning content.

3.5 To identify and to define the elementary mechanical functions as listed under learning content.

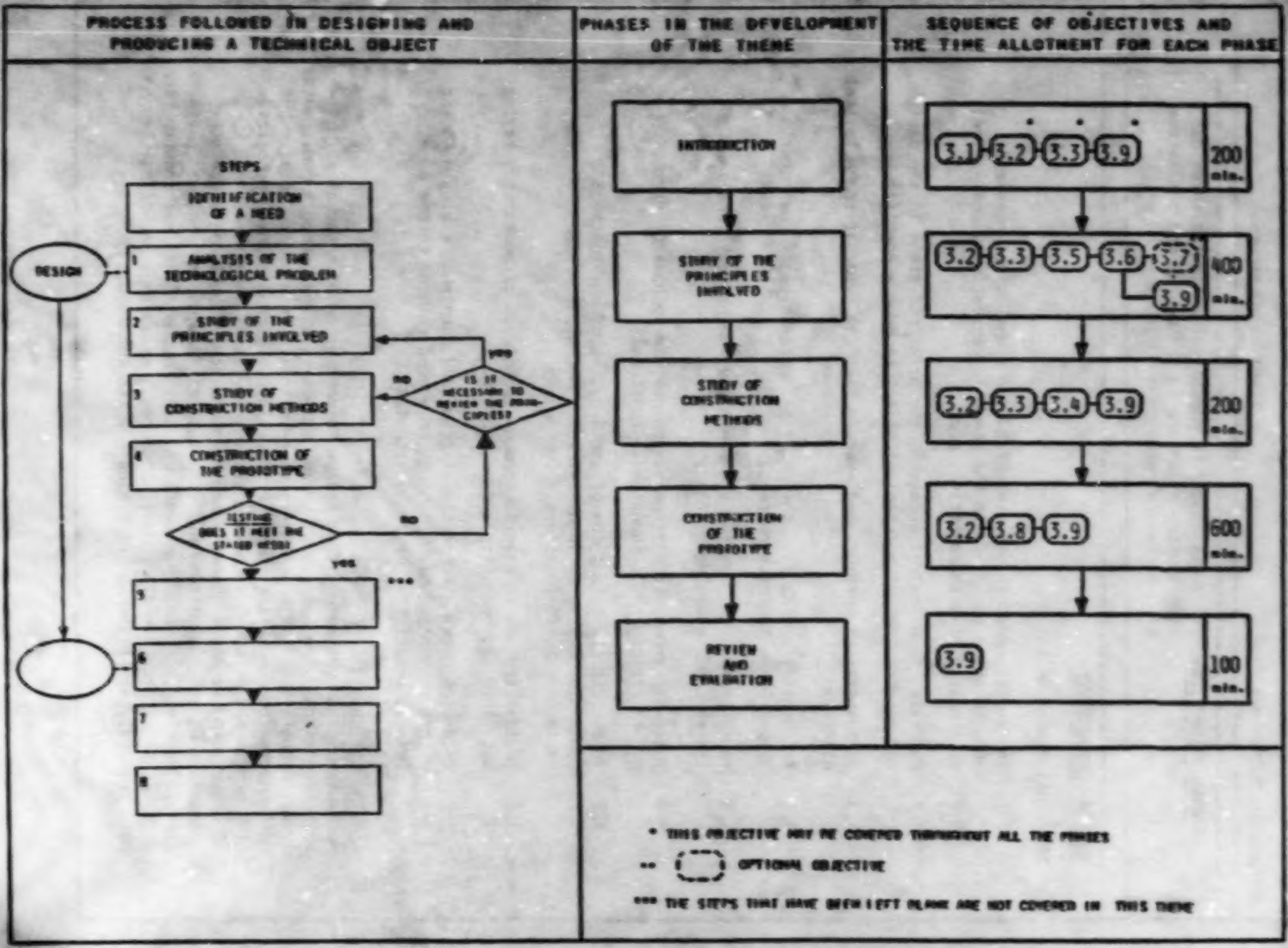
3.6 To identify certain systems having complex mechanical operations and to explain their functions. (Optional)

3.7 To explain the principles of the 4 cycles of the internal combustion engine by identifying its principal systems and explaining their functions. (Optional)

3.8 To identify and to describe common techniques of measuring, laying out, forming, machining and assembling.

3.9 To design, draw a schematic diagram, and construct a simple object with a mechanism which responds to a need related to the home, leisure activities, or transportation.

LEARNING CONTENT:
Mechanism—prototype—steps from design to completion of a technical objects—technological diagrams: types, purposes, rules, symbols—movements: types, symbols—materials—primary or raw material—equipment—wood: hardwood, softwood—metals—non-ferrous alloys—ferrous alloys—properties of a metals and alloys—elementary mechanical functions—properties of connectors—simple machines—complex mechanical functions—systems: transmission, transformation—4-stroke internal combustion engine: parts, systems, cycles (optional)—sequence of steps in the design and construction of a technical product—diagrams—techniques: measuring, machining, laying out, forming, assembling—safety rules for the workshop.


PROCESS FOLLOWED IN DESIGNING AND PRODUCING A TECHNICAL OBJECT
STEPS
IDENTIFICATION OF A NEED
DESIGN
1 ANALYSIS OF THE TECHNOLOGICAL PROBLEM
2 STUDY OF THE PRINCIPLES INVOLVED
3 STUDY OF CONSTRUCTION METHODS
4 CONSTRUCTION OF THE PROTOTYPE
IS IT NECESSARY TO REVIEW THE PRINCIPLES?
YES
NO
TESTING DOES IT MEET THE STATED NEEDS?
NO
YES
***
5
6
7
8
PHASES IN THE DEVELOPMENT OF THE THEME
INTRODUCTION
STUDY OF THE PRINCIPLES INVOLVED
STUDY OF CONSTRUCTION METHODS
CONSTRUCTION OF THE PROTOTYPE
REVIEW AND EVALUATION
SEQUENCE OF OBJECTIVES AND THE TIME ALLOTMENT FOR EACH PHASE
3.1 3.2* 3.3* 3.9*
200 min.
3.2 3.3 3.5 3.6 3.7 3.9
400 min.
3.2 3.3 3.4 3.9
200 min.
3.2 3.8 3.9
600 min.
3.9
100 min.

* THIS OBJECTIVE MAY BE COVERED THROUGHOUT ALL THE PHASES

** ( ) OPTIONAL OBJECTIVE

*** THE STEPS THAT HAVE BEEN LEFT BLANK ARE NOT COVERED IN THIS THEME

INTRODUCTION TO TECHNOLOGY THEME: MECHANICAL TECHNOLOGY		GENERAL OBJECTIVE The pupil should be capable of following a logical step-by-step procedure in the design and completion of a mechanical product or object.		
TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
3.1 Without using written reference material, the pupil should be able to identify certain objects which have a mechanical movement; objects which one finds in the home, in recreational activities, in the area of transportation, etc. (20)	Mechanism: Consult up-to-date dictionaries to find an appropriate definition of this term. Technical objects which have a mechanical movement.	. Show pupils several objects with and without a mechanical movement. . In a discussion session, help pupils discover the difference between these two categories of objects. . Write on the blackboard the definition of the word "mechanism." . Have pupils find other objects which incorporate one or more mechanical movements.	. Question and answer session. . Pupils should write down the definition and several examples of objects. . Pupils should give examples.	Formative Evaluation . Assess pupil's responses. . Evaluate their written work. Summative Evaluation Objective test item: - From a list of objects or pictures of objects, identify those which incorporate one or more mechanical movements. Note: A reminder to the teacher that summative evaluation takes the form of a test or examination given on completion of a theme and/or at the end of a term.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES

3.2 Using data, the pupil should be able to state, in a logical sequence, the principal steps in the design and construction of a technical object to meet a specific need.
(50)
	Steps from design to completion of a product (object):
	- design of a prototype:
	  - statement of need
	  - study of the principles involved
	  - study of construction methods
	  - construction of the prototype
	- production:
	  - planning
	  - construction
	- marketing.
	Prototype:
	First sample of an object constructed before a mass-production run is started.
		Objectives 3.2 and 3.3 should be covered together.
		Write the steps and phases in the process in large letters on different coloured sheets of posterboard. Put these up on the wall for pupils to refer to as needed.
		. Using a simple object (e.g., a paper punch) and the sheets on the wall, present the process to be followed.
		. On the blackboard complete the four schematic drawings as the steps in the process are covered.
			. Question and answer session.
			. Pupils should make the four types of schematic drawing on a worksheet.
			(See Appendix 10.)
				Formative Evaluation
				. Assess pupils' responses to check how much they have understood.
				. Evaluate their worksheets.
				Summative Evaluation
				Different types of objective test items:
				- Put into the correct order the following steps in the process of designing and producing a technical object;
				- Select from among the following, the correct definition of the word "prototype";

3.3 Using illustrations, the pupil should be able to identify, interpret, and execute four types of technological diagrams. (150)	Purpose and elementary rules of the schematic diagram. Technological diagrams: - situating the problem in context - description of object (optional) - principle(s) - construction.	Reference Material Curriculum Guide, Basic Concepts of Schematic Drawing, Mechanics and Electricity, chaps. I-III, Ministère de l'Éducation, Code 16-4888-02A. Explain the aims and rules of schematic drawing to pupils at appropriate moments.		- Choose appropriate words from the following list to complete the definition of the term "schematic drawing"; - Identify the following schematic drawings;

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
	Types of action and symbols: - rotation - rectilinear translation (back and forth motion) - helical.	To help pupils understand the principles and construction diagrams you could give each pupil an object (e.g., a paper punch).		- Referring to the picture of a technical object, choose the best principles diagram from among the selection given; - Match the following motions with the appropriate symbols; - Select the appropriate symbol to complete the picture.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
3.4 Using samples and/or objects, the pupil should be able to identify and to list the principal properties of the materials listed under learning content. (75)	Material: Substance from which things may be made. Raw material: Unmanufactured material. Equipment: All the objects, tools, and machines used in carrying out a project. Softwood: - spruce - pine. Hardwood: - maple - cherry. Non-ferrous metals and alloys: - aluminum -copper - brass -bronze - white metal -lead - tin -zinc. Ferrous metals and alloys: - steels - iron. Properties of metals: - density - colour	. Using examples, explain the difference between "material," "raw material," and "equipment." . Give an appropriate audio-visual presentation. . Following the presentation, give pupils samples of metals, woods, and plastics, and explain their properties. These samples can be mounted on a pegboard panel that is put up on the classroom wall. . Analyze with the pupils an object which incorporates a number of these materials.	. Question and answer session. Pupils should complete a worksheet on the concepts discussed. Reference Material Curriculum Guide, Basic Concepts of Schematic Drawing, Mechanics and Electricity, chap. VI, Ministère de l'Education, Code 16-4888-02A. . Using the samples, pupils should complete a worksheet on this subject. Reference Material Ibid, chap. VI, 6.5. . Using objects, pupils should complete worksheets in large groups and then in small groups.	Formative Evaluation - Assess pupils' oral responses. - Evaluate their worksheets. Summative Evaluation Different types of objective test items: - Identify pictures of materials, equipment, and raw materials; - Match the properties listed with metal, wood, or plastic materials; - Give examples of objects made partly or wholly from given materials;

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
	- mechanical resistance - conduction of heat and electricity. Plastics: - plexiglass -polystyrene - fiberglass -polyethylene - vinyl. Types of forces and symbols: - tension - compression - shear (optional) - torsion (optional). Other symbols: - complete bonding - guiding (rotation, translation) - transmission systems and transformation of movement (optional).	. Using objects or demonstration models, explain the different types of forces and symbols. Have pupils give examples. Put the symbols on the blackboard. Cover the concepts of motion and force during the study of principles. Symbols used in schematic drawing should be introduced as needed, rather than all at the same time. It should be noted that a different strategy could be used to achieve the same purpose. It involves identifying a simple object from the different schematic drawings and then presenting the steps followed in the process in the form of a synthesis.	Reference Material Ibid, chap. VI, 6.5. . Pupils should observe the demonstrations and orally identify the motions of given objects and the forces which act on them. . Pupils should record the symbols for the motions and forces, and put some of these on diagrams.	- From among different symbols of force, choose the one which is appropriate for a given principles diagram. Different types of test items: - From a picture of a simple object, make principles and construction diagrams; - From a description of a need, make a diagram to show the identified problem in context.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
3.5 Using sample objects, the pupil should be able to identify and to define the elementary mechanical functions as listed under learning content. (75)	Elementary mechanical functions: - connecting - guiding - sealing - supporting - lubricating. Properties of connectors: - can be taken apart (dismantled) - permanent - partial - total - rigid - elastic - direct - indirect.	. Using an object (e.g., a bicycle), explain the different elementary mechanical functions and help pupils to identify the parts which fulfill these functions. Reference Material Curriculum Guide, Basic Concepts of Schematic Drawing, Mechanics and Electricity, chap. IV, Ministère de l'Education, Code 16-4888-02A. . Give pupils a summary sheet of these concepts. . Using a transparency, analyze the construction drawing of a simple object, identifying the elementary mechanical functions. . Using the same object, analyze the properties of the connectors. The analysis of the properties of fasteners (connectors) may be carried out after the object has been constructed (Objective 3.9), using this object for the analysis.	. Pupils should complete two worksheets on these concepts. Reference Material Ibid, chap. IV, Learning Activities.	Formative Evaluation . Assess pupils' oral responses. . Evaluate their worksheets. Summative Evaluation Different types of objective test items: - List the elementary mechanical functions; - In the following illustrations, identify the mechanical function of given parts of technical objects; - Match the following properties with the fasteners in the diagrams or illustrations.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
3.6 Using technical objects and/or illustrations, the pupil should be able to identify certain systems having complex mechanical operations and to explain their functions. (Optional) (150)	Simple machine: Object designed to ease the work of man by reducing the amount of effort he must make. Simple machines: - lever - wheel - pulley - inclined plane - screw. Complex mechanical functions: - transmission - transformation. System: Apparatus or device formed by putting a set of parts together to form a working whole. Transmission systems: - gears - friction wheels - pulley and belt systems - chain and sprocket. Transformation systems: - connecting rod and crank (crankshaft) - cam and lifter - rack and pinion - screw and nut - gear-wheel and worm gear.	. Give an appropriate audio-visual presentation. . In a discussion session, sum up the content of the presentation. . Using an object (e.g., a bicycle), have pupils identify simple machines that form part of mechanical systems. . Explain the complex mechanical functions performed by these systems. . Give pupils a summary sheet on these concepts. Reference Material Curriculum Guide, Basic Concepts of Schematic Drawing, Mechanics, and Electricity, chap. V, Ministère de l'Education, Code 164800-02A.	. Question and answer session.	Formative Evaluation . Assess pupils' oral responses. . Evaluate their worksheets and their oral presentations of the results of the analysis. Summative Evaluation Different types of objective test items: - Match the pictures of simple machines with the corresponding terms; - List the two complex mechanical functions; - Identify the systems by matching pictures and terms; - From a list of objects, identify those which have systems that perform a complex mechanical function; - Using a schematic drawing, resolve a simple problem concerning speed;

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
		. Using demonstration models and/or any other appropriate technical object, have pupils analyze systems with complex mechanical functions.	. In small groups using worksheets, pupils should analyze given mechanical systems. Reference Material Ibid, chap. V, Worksheets.	- In the following drawings and /or illustrations, identify the driving parts and the driven parts; - Find several examples of objects that have a complex mechanical function.
3.7 Using a demonstration model or an illustration, the pupil should be able to explain the principles of the 4 cycles of the internal combustion engine by identifying its principal systems and explaining their functions. (Optional) (75)	Engine parts: - piston and piston rings - connecting rod - crankshaft - cylinder - spark plug - valve train - ignition (points) - cylinder block - crankcase - flywheel.	It is a good idea to complete Objective 3.6 before tackling this one. . By means of a demonstration model and discussion, give pupils the names of the essential components of an engine.	. During a question and answer session, pupils should complete a worksheet on the names of the parts of an engine. (See Appendix 11.)	Formative Evaluation . Evaluate pupils' worksheets. . Following the demonstration of the operating cycle, ask some pupils to repeat the demonstration in order to find out how much they have understood.
	Transmission and transformation systems: - rod and crankshaft - cam and lifter - gears - chain and sprocket.	. Using a demonstration model, show pupils the general operation of an engine, starting with the driving part and going through the different mechanical systems to the driven parts.	. Pupils should observe the demonstration and then discuss it.	Summative Evaluation Different types of objective test items: - On a schematic drawing, identify the parts of an internal combustion engine;
	Cycles of 4-stroke internal combustion engine: - intake - compression - power - exhaust.	. Show pupils the operating cycle and have them complete a worksheet on it.	. Pupils should complete a worksheet on the four cycles of an engine.	- Put into the correct order the four cycles of the internal combustion engine;

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
3.8 In brief, simple terms, the pupil should be able to identify and to describe common techniques of measuring, laying out, forming, machining, and assembling. (75)	Techniques for measuring and laying out, using: - pencil - ruler - scriber - punch - square. Machining techniques: - sawing -sanding - drilling -grinding - filing -planing - tapping -milling - thread-cutting. Forming techniques: - bending. Assembly techniques: - nailing - gluing - riveting - soldering - screwing - bolting - pinning.	Reference Material Ibid, chap. VII, Learning Activities. These techniques should not be described in one session, but rather, explained as needed. Go over these techniques during the construction of the prototype phase (Objectives 3.9 and 4.10) and the assembly-line production phase (Objective 5.5). . Using production specifications, demonstrate the operations to be carried out by presenting: - the necessary tools, - how to use them, - safety rules. Regularly have some of the pupils repeat the same actions.	Reference Material Ibid, chap. VII, Learning Activities. . Pupils should observe the operations and participate in a question and answer session on them.	- Identify from among a list of terms, those which specify mechanical systems found in a 4-stroke internal combustion engine. Formative Evaluation . Assess pupils' oral responses. . Evaluate how much pupils have understood by having a few randomly-chosen ones repeat the demonstration. . In some cases, predetermined criteria may be used to evaluate pupils' skills and to assign a score. Summative Evaluation Different types of objective test items: - Match the terms with illustrations of tools; - Match the techniques with the names of tools; - Identify the illustrations which show correct techniques; - Choose from among several illustrations, those which show safety rules to follow in the workshop.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
5.9 Following the logical steps in the design of a technical object, the pupil should be able to design, draw a schematic diagram, and construct a simple object with a mechanism which responds to a need related to the home, leisure activities, or transportation. (750)	Logical steps in the design and construction of a technical product. Diagrams Common techniques: - measuring - machining - laying out - forming - assembling. Safety rules for the workshop.	Select an object with a simple mechanism which pupils are capable of making. Refer frequently to the process described on the wall posters.		**Formative Evaluation** . Assess pupils' oral responses. . Evaluate the drawings made on the blackboard.
		. Using a transparency or the blackboard, present a technological problem arising from a need. Give pupils a copy.	. Question and answer session on the "putting the problem in context" diagram.	. Evaluate pupils' written work (worksheets, drawings, production specifications, write-ups of experiments).
		. Work out with pupils the conditions under which the object will be made and used. Have pupils make a diagram to show the object in context.	. The class should make a context diagram on the blackboard. One pupil should draw as the rest give directions. Then pupils should copy the drawing into their workbooks.	. Evaluate the completed object (prototype) according to specific criteria. (See Appendix 6.) **Summative Evaluation** Different types of objective test items:
		. Have pupils research the principles involved. Before doing this research, pupils could be asked to identify the same principle(s) in existing objects. Simple demonstration material can be used to explain some of the principles.	. Individually, pupils should make schematic drawings of the principles involved in meeting the given technological need.	- In the following diagrams, identify dimensions, forms, positions; - In the following production specifications, identify the sequence of operations, the materials required, and the tools needed to carry out given operations;

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
				- To identify the illustrations which show the correct use of given tools.
		. Select the best diagrams and have pupils copy them on the blackboard. The class can analyze them in terms of the conditions for making and using the object to be produced.	. Pupils take part in this activity as needed.	
		. Select the best hypotheses and make a complete schematic drawing (synthesis) on the blackboard.	. Pupils should copy the complete diagram.	
		Depending upon the complexity of the object to be made, the study of principles may be effected in different steps. In each step, the work covered should be summarized in a partial principles diagram. It is not necessary, however, to reproduce all the partial diagrams.		
		Pupils who have found interesting and applicable principles, could be asked to make prototypes at home. These could then be used to make a comparative study with the prototypes made in class.		

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
		. Have pupils identify some construction problems and, using samples of different materials, have them find solutions to these problems. Ask pupils who have found construction solutions to draw diagrams of these on the blackboard. Help them make any corrections required. It is not necessary to find all the construction solutions.	. Pupils should make diagrams of construction solutions for the problems identified in the principles diagrams. Pupils should analyze these in a question and answer session.	
		. Use a transparency to show pupils the complete construction diagram (synthesis) and have them interpret it.	. Pupils should interpret the construction diagram in a question and answer session.	
		. Give pupils the detail and assembly drawings and the production specifications to complete. During discussions and demonstrations, make each of the parts, emphasizing correct and safe handling of each tool (see Objective 3.8).	Through discussion, pupils should interpret and complete the production specifications as they participate in the demonstrations.	

TERMINAL OBJECTIVE	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
		Have pupils make a sketch (orthographic projection) of one of the simplest parts for homework. The sketch should be based on the construction diagram and given dimensions.	. Using tools and different materials, pupils should make each of the parts of the prototype according to the production specifications.	
		Repeat some of the demonstrations or explanations as the need arises.	. Through discussion, pupils should interpret the assembly specifications as they observe the demonstrations.	
		. When the parts have been made, explain the steps to be taken in assembling the object and demonstrate the assembling and finishing techniques.	. Using tools and following the assembly specifications, pupils should assemble the parts and complete the finishing process.	
			. Pupils should detect problems and adjust the device (calibrate if necessary).	
		Avoid diagnosing problems for pupils. They should be guided in the right direction and encouraged to work them out on their own.		
		Stress the quality of the finish of the prototype. Unfinished work should not be allowed to leave the classroom.		

THEME 3: MECHANICAL TECHNOLOGY

REFERENCE MATERIALS		THEMES				
MONOGRAPHS	Remarks	1	2	3	4	5
Cavendish, Marshall. The Marshall Cavendish Encyclopedia of Science and the Future. Volume 2 Machine Technology. Freeport, Newport: Marshall Cavendish Corporation. 1982.	General reference			x		
DeBono, E. Lateral Thinking, A Textbook of Creativity. Markham, Ontario: Penguin Books, 1980.	General reference			3.9		
Dodd, T. Design and Technology in the School Curriculum. London: Hodder and Staughton, 1978.	General reference			3.9		
Green, Peter. Design Education: Problem Solving and Visual Experience. London: B.T. Batsford Ltd., 1974.	Teacher's reference - very useful for design projects.			3.9		
Hicks, G. A., G. M. Heddle and P. A. Bridge. Design and Technology - Metal. Willowdale, Ontario: Pergamon Press Canada Ltd., 1975.	Good reference book with specific activities			3.4		
Kimbell, Richard. Design Education: The Foundation Years. Boston: Routledge & Keegan Paul, 1982.	General reference text			3.9		
Willet, R. Design and Technology: Plastics. Willowdale, Ontario: Pergamon Press Canada Ltd., 1977.	Good reference book with specific activities			3.4		
Willet, R. and E. W. Storey. Design and Technology - Wood. Willowdale, Ontario: Pergamon Press Canada Ltd., 1974.	Good reference book with specific activities			3.4		
Schools Council Modular Courses in Technology. Materials Technology. Edinburgh: Oliver and Boyd, 1980.	Good reference book - activities oriented			3.4		

THEME 3: MECHANICAL TECHNOLOGY

MONOGRAPHS	Remarks	THEMES 1	2	3	4	5
Schools Council Modular Courses in Technology. *Mechanisms*. Edinburgh: Oliver and Boyd, 1980.	Good reference book - activities oriented			3.5		
Schools Council Modular Courses in Technology. *Problem Solving*. Edinburgh: Oliver and Boyd, 1980.	Good reference book - activities oriented			3.9		
Shaw, D. F. and J. M. Reeve. *Design Education for the Middle Years*. Toronto: Hodder and Stoughton, 1981.	See Chapters 1, 2, 6 & 7 Teacher's reference			3.9		
Torrance, F. E. *Encouraging Creativity in the Classroom*. Dubuque, Iowa: William C. Brown Co., 1970.	Teacher's reference book - Methods and strategies			3.9		
Walton, Harry. *The How and Why of Mechanical Movements*. New York: E.P. Dutton and Co. Inc., 1975.	General Reference			3.6		

THEME 3: MECHANICAL TECHNOLOGY

		THEMES				
AUDIOVISUAL	Description	1	2	3	4	5
Design A discussion of the role of science and technology in today's society, between Professor J.C. Jones, Professor of Design at the Open University, and Dr. Robert Jungk. International Tele-Film Enterprises	Film No. T100/33, black and white			3.9		
Design Project I A film designed to give an understanding of design strategies, such as choice and use of methods and their control. International Tele-Film Enterprises	Film No. T262/09, black and white			3.9		
Design Project II This program tries to identify specific design problems in a project: "Low Impact Diets" by Robin Roy. International Tele-Film Enterprises	Film No. T262/10, black and white			3.9		
Discovering Simple Machines The four basic machines and the concepts behind them are introduced. Examples are presented so that students can observe the functions of the machines and be challenged to formulate generalizations about simple machines. 1. Levers 2. Wheels 3. Inclined Plane 4. Screw Includes: 4 Filmstrips 2 Cassettes 1 Teacher's Guide with student objectives, lesson plans, scripts, discussion questions, and projects 1 Skill Packet of Spirit/Blackline Duplicating Masters with student activities Wintergreen Communications Limited	Catalogue No. 65602 K, black and white			3.5		

THEME 3: MECHANICAL TECHNOLOGY

		THEMES				
AUDIOVISUAL	**Description**	1	2	3	4	5
Energy and Work Demonstrates some characteristics of energy: its ability to do work; that it is neither created nor destroyed, but changed from one form to another; that energy can be stored; and that the energy in moving objects is kinetic. Encyclopedia Britannica Films	No. 1870 colour, 11 minutes			3.5		
Henry's Simple Machine Little Henry's tool box is on the top closet shelf and he can't reach it. His brother Tom urges him to extend his own capabilities through tools or machines and gives a lecture about the basic simple machines underlying all of society's more complex devices. BFA Film Video, Media Department Holt Rinehart and Winston of Canada Limited	No. 11163 11 minutes, colour video			3.9		
The Inclined Plane Family The operation of the inclined plane is shown through a series of simple experiments. The film also describes other members of the inclined plane family - the wedge and the screw. Encyclopedia Britannica Films	No. 1748 11 minutes, colour			3.5		
The Internal Combustion Engine: Principles of Operations The basic operating principles of the internal combustion engine are explained by the use of models and animation. United States Army Air Force 1944 Canadian Film Institute	29 minutes, black and white, 1944			3.7		
The Lever - Simple Machines Levers help us to do work by changing the direction of force or by trading force for distance. The three parts of the lever are examined and movements are computed. Don Piccolo Film, BFA Film Video, Media Department Holt, Rinehart and Winston of Canada Limited	No. 10960 10 minutes, colour			3.1 3.5		

THEME 3: MECHANICAL TECHNOLOGY

		THEMES				
AUDIOVISUAL	**Description**	1	2	3	4	5
The Lever Family (Lever, Pulley, Wheel and Axle) The operating principles of basic machines in the lever family are demonstrated, as well as how they are related to each other and how each makes work easier. Encyclopedia Britannica Films Multimedia Audiovisual Inc.	No. 1750 14 minutes, colour			3.5		
Machines: The Science Alliance Program A look at simple machines such as the lever, the wheel and the axle, and explanations of how they make work easier. Includes: Teacher's Guide and Student Activities. TV Ontario Marketing	BPN 199505 30 minutes, colour, video			3.2 3.6		
Making Work Easier Watching men at work on a housing project, a young boy discovers that many objects in everyday use are combinations of simple machines which help make work easier. Encyclopedia Britannica Films Multimedia Audiovisual Inc.	No. 2071 10 minutes, colour			3.1		
Mechanical Advantage and Friction Professors A and B compare the mechanical advantage of an inclined plane with that of a lever. TV Ontario Marketing	BPN 176862 colour, video			3.5		
Profit by Design Winners of the Design Canada Awards are presented. These awards are an incentive to promote good design by Canadian manufacturers, which in turn leads to increased sales and profits. BOMI Productions Limited for the National Film Board National Film Board of Canada	106C 0180 562 6 min. 18 sec.			3.9		

THEME 3: MECHANICAL TECHNOLOGY

		THEMES				
AUDIOVISUAL	Description	1	2	3	4	5
The Pulley Eureka! Shows how a pulley works to lift a heavy object. If you double the number of ropes supporting the weight, you double the mechanical advantage. TV Ontario Marketing	BPN 176864			3.5		
Pulleys and Work In this inquiry-oriented film, a series of experiments explores what the pulley, a typical, simple machine, can and cannot do. Ivanami Film BFA Film Video, Media Department Holt, Rinehart and Winston of Canada Limited	No. 10262 14½ minutes, colour			3.1 3.5		
The Screw and the Wheel This program defines a screw and a wheel: a screw is simply a twisted inclined plane; a wheel is simply a circular lever, whose fulcrum has become an axle. TV Ontario Marketing	BPN 176863 colour, video			3.5		
Simple Machines Explains and demonstrates the six basic machines. Shows how all machines are combinations of these. Encyclopedia Britannica Films, Multimedia Audiovisual Inc.	No. 251 11 minutes, black and white			3.5		
Wheel and Axle: An Introduction Experimenting with different wheel and axle combinations reveals number patterns that help us understand how simple machines work. BFA Film Video	No. 10980 10 minutes, colour			3.1		
Work: Movement Everywhere Designed to define the scientific concept of work. Dozens of visual examples show that when one thing moves another, work is being done. Every example reinforces the basic concept - it takes work to move things. Encyclopedia Britannica Films, Multimedia Audiovisual Onc.	No. 2964 11 minutes, colour			3.1		

THEME 4

ELECTRICAL TECHNOLOGY TIME: 1400 minutes

GENERAL OBJECTIVE: The pupil should be able to design and to construct an object powered by electricity, following a logical step-by-step procedure.

TERMINAL OBJECTIVES:

The pupil should be able:

4.1 To identify certain apparatus or systems which use electricity, objects that are associated with lighting, heating, telecommunications, etc.

4.2 To explain briefly the nature of electricity by describing the different ways it can be produced.

4.3 To describe briefly the principal sources of energy which can be used to produce electricity. (Optional)

4.4 To describe briefly the principal components of a network for the transmission and distribution of electricity. (Optional)

4.5 To name and to draw symbols for the principal components of a simple electrical circuit and describe the function of each part.

4.6 To draw a schematic diagram, assemble component parts, and explain the characteristics of the electrical circuits listed under learning content.

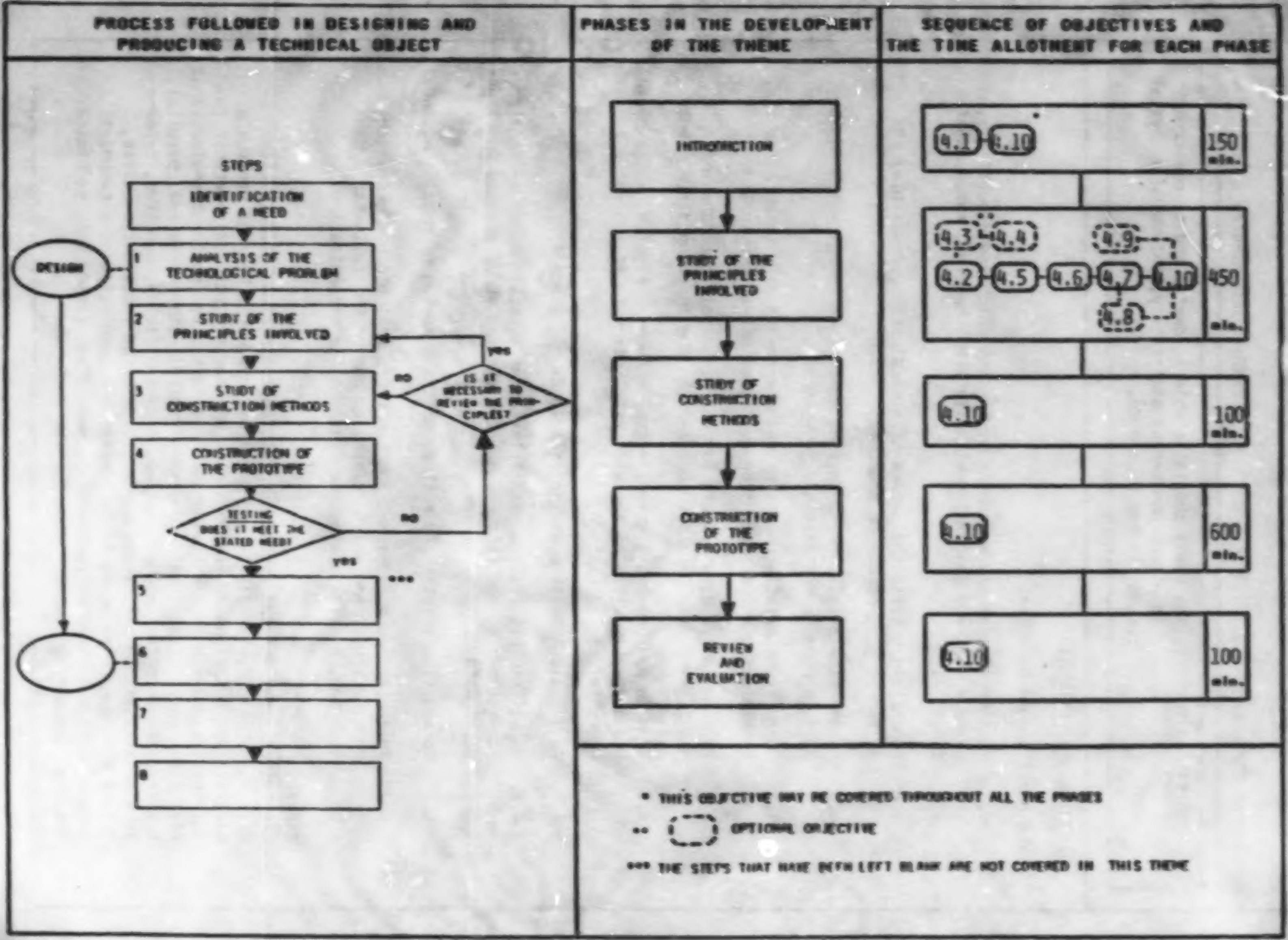
4.7 To explain briefly magnetic principles. (Optional)

4.8 To explain briefly the principles of an electric motor using direct current and to name its component parts and their precise functions. (Optional)

4.9 To describe briefly the methods of transmission of heat. (Optional)

4.10 To design, make diagrams, and construct a simple product which runs on electricity and which relates to one of the following areas: lighting, heating, telecommunications, or mechanization.

LEARNING CONTENT:
Electrical apparatus and system (definition)—electrons—electricity: static, dynamic—current: types—voltage: types—methods of producing electricity, principal sources—sources of energy (optional)—network for for the transmission and distribution of electricity (optional)—electrical circuits: parts, functions of parts—circuits: simple, series, parallel, combination—magnets: magnetic poles, magnetic fields, spectrum, types—laws of attraction—electromagnet—electric motor (optional): parts, function—sequence of steps in the design and completion of a technical product—diagrams—common techniques: measuring, laying out, machining, forming, assembling—safety rules for the workshop.


PROCESS FOLLOWED IN DESIGNING AND PRODUCING A TECHNICAL OBJECT
PHASES IN THE DEVELOPMENT OF THE THEME
SEQUENCE OF OBJECTIVES AND THE TIME ALLOTMENT FOR EACH PHASE
STEPS
IDENTIFICATION OF A NEED
DESIGN
1 ANALYSIS OF THE TECHNOLOGICAL PROBLEM
2 STUDY OF THE PRINCIPLES INVOLVED
3 STUDY OF CONSTRUCTION METHODS
4 CONSTRUCTION OF THE PROTOTYPE
IS IT NECESSARY TO REVIEW THE PRINCIPLES?
YES
NO
TESTING DOES IT MEET THE STATED NEED?
NO
YES
5
***
6
7
8
INTRODUCTION
STUDY OF THE PRINCIPLES INVOLVED
STUDY OF CONSTRUCTION METHODS
CONSTRUCTION OF THE PROTOTYPE
REVIEW AND EVALUATION
4.1
4.10
*
150 min.
4.3
4.4
**
4.9
4.2
4.5
4.6
4.7
4.10
4.8
450 min.
4.10
100 min.
4.10
600 min.
4.10
100 min.

* THIS OBJECTIVE MAY BE COVERED THROUGHOUT ALL THE PHASES

** ⬚ OPTIONAL OBJECTIVE

*** THE STEPS THAT HAVE BEEN LEFT BLANK ARE NOT COVERED IN THIS THEME

INTRODUCTION TO TECHNOLOGY THEME: ELECTRICAL TECHNOLOGY		GENERAL OBJECTIVE The pupil should be able to design and to construct an object powered by electricity, following a logical step-by-step procedure.		
TERMINAL OBJECTIVES	**LEARNING CONTENT**	**TEACHING STRATEGIES**	**LEARNING ACTIVITIES**	**EVALUATION PROCEDURES**
4.1 Without using written reference material, the pupil should be able to identify certain apparatus or systems which use electricity, objects that are associated with lighting, heating, telecommunications, etc. (20)	Electrical apparatus and systems: Technical products which run on electricity. Electrical products and systems.	. In a question and answer session, help pupils to give simple definitions of the terms: electrical apparatus and electrical system.	. Pupils should give an oral definition of the terms: electrical apparatus and electrical system.	Formative Evaluation . Assess pupils' responses. . Evaluate the work of each group.
		. Have pupils make a list of household objects that fall into the two categories mentioned above. The tables can be divided into columns for each of the following group of objects: - motorized apparatus - lighting systems - heating systems - telecommunication systems	. In small groups, pupils should make lists of electrical objects on the blackboard.	. Evaluate written work. Summative Evaluation Objective test item: - Give examples of electrical objects which meet specific needs.
		. Pupils can be divided into teams and one pupil per team chosen to write the names of the objects in the columns as team members identify them.		Note: A reminder to the teacher that summative evaluation takes the form of a test or examination given on completion of a theme and/or at the end of a term.
		. Discuss each team's work, giving advice when necessary. For homework, pupils could illustrate some or all of the objects listed.	. Pupils should record examples from each group of objects in their workbooks.	

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
4.2 Without using written reference material, the pupil should be able to explain briefly the nature of electricity by describing the different ways it can be produced. (100)	Ideas relating to electricity: - electron theory - types of electricity: -static -dynamic - types of electric current: -direct -alternating - voltage supply: -for domestic use -for transportation -for portable apparatus. Methods of producing electricity: -friction -chemical action -light -pressure -heat -magnetism. Principal sources: - battery (single cell): -dry -wet -photovoltaic -battery (multiple cells): -generator: -magneto -alternator.	. Show pupils a film about electricity. Before showing the film, tell pupils that there will be a discussion of specific points covered in the film. . At the end of the film, go over these points in detail. Reference Material Curriculum Guide, Basic Concepts of Schematic Drawing, Mechanics, and Electricity, chap. VIII, Ministère de l'Education, Code 16-4880-02A . Using a multimeter, measure the voltage in a domestic plug outlet and in a range of different batteries. . Using diagrams drawn on the blackboard, make an analogy between: - the electrical current in a wire and the flow of water in a hose; - electrical voltage and the pressure in a hose.	. Pupils should discuss what they have learned from the film. . Question and answer session.	Formative Evaluation . Assess pupils' responses. . Evaluate their homework. Summative Evaluation Different types of objective test items: - From a list of suggested terms, identify the electrical particles which, by their movement, generate electricity; - Complete a sentence in which two types of electricity and the two types of electrical current are identified; - From a list of sources, identify those which generate direct current; - Match the following objects with methods of producing electricity; - Match the following voltages with the appropriate sources of current.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
		. Give demonstrations to show the different ways in which electricity can be produced: - friction: do the experiment that involves the use of a comb and paper; - pressure: show pupils the arm of a record player, or an electronic lighter, dismantled if possible. - heat: make a thermocouple using two different types of wire (copper and steel) and test it with a multimeter; - light: use a light meter or a photo-electric cell and test it by means of an incandescent lamp or a multimeter; - magnetism: join a coil of wire to a multimeter and make it move near a permanent magnet; - chemical action: do the experiment of a lemon made into a battery by putting copper and zinc electrodes inside it.	. Pupils should observe and participate in the demonstrations.	Short-answer test item: - Explain the meaning of electrical voltage and current by making an analogy with water.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
		Prepare the materials for these experiments and demonstrations in advance so as to save time when presenting the concepts. Films can be used to introduce these concepts.		
		. Using a number of objects, show pupils different sources of electricity, classifying them according to the type of current produced, and have pupils analyze a section of a battery.	. Pupils should identify parts of batteries on a sheet of paper. Reference Material Curriculum Guide, Basic Concepts of Schematic Drawing, Mechanics, and Electricity, chap. IX, 9.1 Learning Activities, Ministère de l'Éducation, Code 16-400002A.	
		. Use a summary sheet of the concepts studied to go over what has been covered.	For homework, pupils should summarize the six ways in which electricity can be produced, illustrating each one with a diagram.	
		Reference Material Ibid, chap. IX, 9.1.	Note: This assignment could be started as a class activity.	

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
4.3 From written reference material or illustrations, the pupils should be able to describe briefly the principal sources of energy which can be used to produce electricity. (Optional) (50)	Sources of energy: -fossil fuels .coal .gas .petroleum -renewable fuels .wood .peat -heat of earth (geothermal energy) -solar -hydro-electric -nuclear -wave motion -wind power.	It is recommended that Objectives 4.3 and 4.4 be taught at the same time. . Using illustrations and/or slides, present the different sources of energy used to produce electricity, making a distinction between "soft" energy and other forms of energy. . Give pupils a sheet with pictures which summarize these ideas.	. Question and answer session.	**Formative Evaluation** . Assess pupils' responses. . Evaluate pupils' worksheets. **Summative Evaluation** Short-answer test item: - In reference to an illustration, describe briefly a source of energy. Different types of objective test items: - From a list of terms, identify those which denote sources of energy;
4.4 From an illustration, the pupil should be able to describe briefly the principal components of a network for the transmission and distribution of electricity. (Optional) (40)	Components: -generators -transformers -high-tension lines -step-down transformers (sub-stations) -primary distribution .cross-country .industrial -secondary distribution (homes).	. Using a transparency, show pupils a network for the transmission and distribution of electricity. Reference Material Ibid, chaps. IX and X.	. Pupils should identify the principal components of a network for the transmission and distribution of electricity, on a worksheet. Reference Material Ibid, chap. IX.	- From a list of terms, identify some of the components of a network for transmitting and distributing electricity; - List in order the following terms or illustrations of the different components of a network for transmitting and distributing electricity.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
4.5 Without using reference material, the pupil should be able to name and to draw symbols for the principal components of a simple electrical circuit and to describe the function of each part.	Components: -source of electricity -conductor -overload protection -control mechanism (switches) -electrical apparatus.	. Using a test panel (with low voltage), have pupils identify the different components of a simple circuit and then have them specify their function and compare them with commonly used circuits. Reference Material Ibid, chap. IX.	. Question and answer session.	Formative Evaluation . Assess pupils' responses. . Evaluate the diagrams in pupils' workbooks. . Evaluate pupils' work on the test panels.
(Optional) (60)	Symbols: -source of electricity -dry battery -wet battery -domestic current -conductors -wire -earth ground -chassis ground -protection -fuse -control mechanisms (switches) -knife switch -push button switch (optional) -electrical apparatus -incandescent lamp (optional) -heating element -electromagnet (optional) -electric motor (optional). Functions of various parts of the system: -supply -conductor -insulation	. Assemble pupils around a test panel and ask one of them to make a simple circuit to light an incandescent lamp. . Draw a diagram of a simple circuit on the blackboard, using the different symbols and summing up the ideas presented. Distinguish between an open and a closed circuit.	. Pupils should participate in, or observe, the setting up of a simple circuit. . Pupils should reproduce the diagram of a simple circuit and name each part.	Summative Evaluation Different types of objective test items: - Match the following symbols with the electrical components; - Using a list of names, identify illustrations of electrical components; - Complete a diagram of a simple circuit by adding symbols in the appropriate places; - On a schematic diagram, indicate whether the circuit is open or closed.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
	-controls -transformers.			
4.5 Using a test panel, the pupil should be able to draw a schematic diagram, assemble component parts, and explain the characteristics of the electrical circuits listed under learning content.	Characteristics of circuits:	Divide the group in teams of two and give each team a test panel.	. Pupils should set up circuits on the test panels.	Formative Evaluation . Assess pupils' responses.
	Open circuit—closed circuit.			. Evaluate their diagrams (solutions to the problems).
	Open circuit—closed circuit: -simple -series -parallel -combination.	. Draw diagrams on the blackboard of a series circuit and a parallel circuit and explain the difference between the two (distribution and flow of current).	. Question and answer session.	. Evaluate the set-ups on the test panels.
(200)	Characteristics: -distribution of current -flow of current.	Reference Material Ibid, chap. X.		Summative Evaluation Different types of objective test items:
		. Erase the diagrams of the circuits and ask pupils to draw them on a sheet of paper.	. Pupils should draw a series circuit and a parallel circuit on a sheet of paper. (See Appendix 12.)	- Choose from among several diagrams, the one which is the solution to a given problem;
			. Pupils should set up both types of circuits on the test panel.	- Complete a diagram of a solution to a given problem.
		. Explain the meaning of the combined (series/parallel) circuit and give pupils a series of problems to solve. Have pupils draw diagrams of the circuits (solutions to the problems) before they set up the circuits.	. Pupils should find the answers to problems concerning electricity by making diagrams of the solutions on sheets of paper and then setting up the circuits on a test panel.	Essay test item: - Explain the difference between a series circuit and a parallel circuit.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
4.7 From illustrations and/or diagrams, the pupil should be able to explain briefly magnetic principles. (Optional) (75)	Magnet: -definition -magnetic field .magnetic pole .spectrum .lines of force -laws of attraction and repulsion -types: .natural .artificial. -electromagnet: .core .solenoid .source .inversion of polarity -metals which can be magnetized: .iron .nichel.	. Using demonstration materials, have pupils discover the nature and characteristics of permanent magnets. . Using demonstration materials, have pupils discover the laws of attraction and repulsion of magnets. . Using demonstration materials, have pupils discover the nature and characteristics of temporary magnets. . Using demonstration materials, have pupils discover the laws which govern the polarity of electromagnets. Reference Material Ibid, chap. IX, 9.6.3.	. Question and answer session. . Pupils should make a diagram of the spectrum of a magnet and identify the magnetic poles and lines of force. . Using magnets (and a compass if necessary), pupils should complete a worksheet on the experiment. Reference Material Ibid, chap. IX, 9.6.3.1.C. . Question and answer session. . Pupils should make a diagram of the principles of electromagnets. . Pupils should participate in the demonstration and take notes on the concepts covered.	Formative Evaluation . Assess pupils' responses. . Evaluate the results of the experiment and correct the written work. Summative Evaluation Different types of objective test items: - In the following diagrams, indicate whether there is attraction or repulsion; - From a list of words, identify the parts of an electromagnet; - In the following diagrams, identify the polarity of electromagnets.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
4.8 Using diagrams, the pupil should be able to explain briefly the principles of an electric motor using direct current and to name its component parts and their precise functions. (Optional) (50)	Categories of electric motors: -direct current -alternating current -universal. Component parts: -stator -rotor -brushes -commutator. Function: -laws of attraction and repulsion -inversion of polarity.	The preceding objective (4.7) is prerequisite to this one. . Using an overhead projector, have pupils discover the basic principle of an electric motor by pivoting a magnet by means of a second magnet. . Using a transparency, have pupils discover the principle of the alternating polarity of a rotor. The transparency should include a stator and a rotating rotor for which it is possible to change poles. . Using a second transparency, have pupils discover the principle of a rotor made up of an electromagnet and a commutator supplied with power by brushes. . Using the same transparency, present the complete operating cycle (one rotation of the rotor). . Using different models of motors, briefly show pupils the different categories of motors.	. Question and answer session. . Pupils should complete a principles diagram using a worksheet. (See Appendix 13.)	Formative Evaluation . Assess pupils' responses. . Ask one of the pupils to explain the operating cycle of a motor. . Evaluate the worksheets. Summative Evaluation Different types of objective test items: - On the following diagram, identify the different parts of an electrical motor that works on direct current; - Complete a diagram on the operating cycle by indicating the polarities of the rotor.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
4.9 Without using written reference material, the pupil should be able to describe briefly the methods of transmission of heat. (Optional) (4D)	Methods: -radiation -convection -conduction.	. In a discussion session, explain the modes and nature of heat transmission and ask pupils to suggest examples. Different modes of transmission of heat can also be demonstrated by means of simple teaching materials: - radiation: by placing a 100 watt bulb at a given distance, it can be seen that it gives off heat; - convection: by placing a 100 watt bulb under a cardboard tube, it can be seen that the top of the tube gives off heat; - conduction: by placing a copper wire on a 100 watt bulb, it can be seen that the opposite end of the wire gives off heat	. Pupils should complete a worksheet with illustrations to be identified.	Formative Evaluation . Assess pupils' responses. . Evaluate their worksheets. Summative Evaluation Objective test item: - Identify the modes of transmission of heat shown in the illustrations.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
4.10 By following the logical phases from the design to the construction of a technical object, the pupil should be able to design, make diagrams, and construct a simple product which runs on electricity and which relates to one of the following areas: lighting, heating, telecommunications, or mechanization. (750)	Logical phases in the design and construction of a technical object/product: Diagrams of a technical object Common techniques: -measuring -review -laying out -matching -forming -assembling. Safety rules for the workshop.	Choose an object with a simple electrical circuit that is within pupils' capacity to make. Draw pupils' attention frequently to the procedure described on the wall posters.		Formative Evaluation . Assess the oral responses given during the activities. . Evaluate the diagrams made on the blackboard. . Evaluate written work (worksheets, diagrams, production specifications, write-ups of experiments).
		. Using the blackboard or a transparency, show pupils a diagram showing the context of a technological problem that arises from a need and give them a copy of the diagram.	. Referring to the diagram, pupils should discuss the problem.	. Evaluate the prototype, using specific criteria. (See Appendix 6.) . Give pupils a short oral test on the prototype to evaluate their understanding of the operating principles.
		. Work out with the pupils the conditions under which the object will be made and used. Have them make a diagram to show the object in context.	. Each pupil should make a diagram to show the object in context. Note: This could be given as homework.	Summative Evaluation Different types of objective test items:
		. Select the best of the pupils' diagrams, reproduce them on the blackboard, analyze them, and redo the diagram of the object in context.	. Pupils should take part in analyzing the diagrams and copy down the final version (synthesis).	- Identify the dimensions, forms and positions on the following diagrams; - Match the following techniques with the names of tools; - Match the following terms with pictures of tools;

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
		. Have pupils study the principles involved. Before doing this, pupils could identify the principles involved in existing objects. Review the rules for making principles diagrams.	. Each pupil should make a diagram illustrating one or more principles that constitute a response to a technological problem which has been raised.	- Using production or assembly specifications, identify the sequence of operations, materials to be used, and the tools required to perform certain operations;
		. Select the best of the diagrams done by pupils, reproduce them on the blackboard, analyze them with the class in terms of the conditions under which the object to be made will be constructed and used.	. Pupils should participate in this process.	- Identify illustrations showing the correct use of certain tools.
		. Select the best hypotheses and redraw a complete diagram on the blackboard. Give pupils a copy. Depending upon the complexity of the object to be made, the study of principles may be done in steps. For each step, the teacher should summarize the work covered in a partial principles diagram. However, it is not necessary to reproduce all the partial diagrams.		

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
		Suggest to pupils who have come up with interesting and feasible principles, that they make a prototype of the object at home. Later, a comparative study can be done of these prototypes and one made in class.		
		. Have pupils identify several production problems and find answers (methods).	. Pupils should make sketches of production methods on the blackboard to solve problems raised by the principles diagram. They should analyze these in a question and answer session.	
		Ask pupils who have construction methods to suggest, to come up and draw diagrams of them on the blackboard.		
		Help pupils make any corrections required.		
		It is not necessary to have pupils find all the answers.		
		. Using a transparency, have pupils finish the complete construction diagram.	. In a question and answer session, pupils should interpret and fill in a worksheet that includes a complete construction diagram.	

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
		. Give pupils detail and assembly drawings and production specifications to complete. Through discussion and demonstrations, have pupils construct each of the parts, insisting on correct and safe use of tools. (See Objective 3.8.)	. In a question and answer session, pupils should interpret and complete the production specifications as they take part in the demonstration.	
		Have pupils make sketches (orthographic projection) of one of the simple parts as homework. These sketches should be done from a construction diagram and from specified dimensions.		
		Repeat some of the demonstrations or explanations if required.	. Using tools and different materials, pupils should construct each of the parts of the prototype according to the construction specifications.	
		. Following the construction of the parts, explain the steps in assembling the object and demonstrate the assembling and finishing techniques.	. In a question and answer session, pupils should interpret the assembly specifications as they observe the demonstrations.	

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
		Avoid diagnosing problems for pupils. They should work out their problems on their own.	. Using tools and following the assembly specifications, pupils should assemble the parts and complete the finishing procedure.	
		Stress the quality of the finish of the prototype. Unfinished work should not be allowed to leave the classroom.	. Pupils should identify any problems and adjust the machine if necessary.	
		. If possible, show pupils commercial products designed to meet the same need and have pupils identify the similarities and differences.	. In a question and answer session, pupils should compare the prototype made in class with a commercial product.	

THEME 4: ELECTRICAL TECHNOLOGY

REFERENCE MATERIALS		THEMES				
MONOGRAPHS	Remarks	1	2	3	4	5
Alberta Energy and Natural Resources. Energy Efficient Housing - A Prairie Approach. Edmonton, Alberta: Alberta Energy and Natural Resources, 1982.					4.3 4.9 4.10	
Armstrong, Robert E. Fundamentals of Direct Current. Blue Ridge Summit, Pa: Tab Books Inc., 1986.	Good reference book					
Buban, Peter and Marshall L. Schmitt. Understanding Electricity and Electronics. 3rd Edition. Montréal: McGraw-Hill Book Company, 1975.	Section 6 - Electricity at Work Section 1 - Introduction Section 3 - Energy Sources Section 8 - Electricity and Industry Section 2 - Electric Circuits and Devices Section 6 - Electricity at Work Section 5 - Electrical Wiring, Materials, Tools and Processes Section 10 - Suggested Projects				4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.10	
Burke, James. Connections. Toronto: Macmillan of Canada, 1978.	Chapter 1 - The Trigger Effect an excellent introduction to electrical power - Obtain the first program of the TV series				4.1	
Forrest, M. Mims, III. Getting Started in Electronics. Archer, 1983.	Cat. #276-5003(Avail. from Radio Shack) - Excellent booklet for project work				4.5 4.6	

THEME 4: ELECTRICAL TECHNOLOGY

		THEMES				
MONOGRAPHS	Remarks	1	2	3	4	5
Gradwell, John, Malcolm Welch and Jean-François Vincent. Techno 2000 An Introduction to Technology. Toronto: Copp Clark Pitman, 1986.					4.1 4.10	
Hydro-Québec. Electricity. Montréal, Hydro-Québec, 1970.						
Petruzella, D. Frank. Introduction to Electricity and Electronics. Vol. 1. Montréal: McGraw-Hill Ryerson, 1986.	Unit 4 Sources and Characteristics of Electricity Unit 5 Basic Electrical Units Unit 6 Electrical Connections Unit 7 Simple Series and Parallel Circuits For Advanced Activities: Unit 12 Solving the Series Circuit! Unit 13 Solving the Parallel Circuit Unit 14 Magnetism Unit 15 Electromagnetism				4.2 4.6 4.7 4.8	
School Council Modular Courses in Technology. Electronics. Edinburgh: Oliver and Boyd, 1980.	Introduction - The rest of the booklet is for advanced techniques to be used for enrichment. Note: The workbook and teacher's guide of this booklet are quite useful				4.1	

THEME 4: ELECTRICAL TECHNOLOGY

		THEMES				
MONOGRAPHS	Remarks	1	2	3	4	5
School Council Modular Courses in Technology. Energy Resources. Edinburgh: Oliver & Boyd, 1980.	Ch. 2 Converting Energy Ch. 3 Sources of Energy				4.2 4.3	
Seeds, The Energy Literacy Series. Energy Technologies. Toronto: Science Research Ass., 1982.	Chapter 1 Energy				4.9	
Seeds, The Energy Literacy Series. Renewable Sources of Energy. Toronto: Science Research Ass., 1982.	Complete booklet - very useful activities - teacher's guide available				4.3	
Seeds, The Energy Literacy Series. Sources of Electrical Energy. Toronto: Science Research Ass., 1982.	Complete booklet - very useful activities - teacher's guide available				4.3	
A Sunset Book. Basic Home Wiring. Menlo Park, California: Lane Publishing Company, 1979.	Excellent booklet for home wiring projects as well as information for students				4.4	
Time Life Books. Energy Alternatives. Alexandria, Virginia: Time Life Books, 1982.	General information book for projects around the house. Good ideas for doing models				*	
Time Life Books. Heating and Cooling. Alexandria, Virginia: Time Life Books, 1982.	General information book for projects around the house. Good ideas for models				*	

THEME 4: ELECTRICAL TECHNOLOGY

		THEMES				
AUDIOVISUAL	**Description**	1	2	3	4	5
Alternative Energy Sources General information film on alternative energy resources. Coal conversion to clean power gas, geothermal power, nuclear power and experimental solar energy farms are discussed. Canadian Film Institute	Colour, 30 minutes				4.3	
Basic Electricity Three film loops illustrating the magnetic effect of an electric current and its applications. Simple magnetic effect of an electric current Pt.1: In straight wire, GL.777 Pt.2: In a loop of wire, GL.779 Pt.3: In solenoids and electro-magnets, GL.780 Carman Educational Associates Limited	Series of 3 Super 8mm film loops				4.7 4.8	
Building for the Future The training of apprentices in the use of portable power tools in plumbing, heating and electrical engineering. The film includes a sequence on safety in the use of electrical appliances.	Britain, 1966, 22 minutes, colour, English				x	
Electricity The Motor The Generator Domestic Electricity Domestic Circuits Switch Wiring and Low Voltage Circuits School Services of Canada	ML0397 Set 5 cas/5 str.				4.4 4.6 4.8	
Electricity: The Science Alliance Program A discussion about the people who discovered electricity, and a demonstration of how electricity can pass through certain items. T.V. Program - Teacher's Guide + Student Activities Book. TV Ontario Marketing	30 minutes, colour video Cat. No. BPN 199502				4.2	

THEME 4: ELECTRICAL TECHNOLOGY

		THEMES				
AUDIOVISUAL	**Description**	1	2	3	4	5
Electricity: Distribution The basic concepts of electrical distribution, both cross-country and within the home, are explained. Demonstrations of "line loss" and the use of fuses for overload protection are given. The film content is summarized through a set of review questions. Canadian Film Institute	Colour or black and white, 16 minutes, 1963				4.4	
Electricity and How It Is Made Static and current electricity are illustrated through a series of demonstrations showing how electricity is produced, what it does, and how it is used to give us light, heat, sound and power. Encyclopedia Britannica Films Multimedia Audiovisuel Inc.	No. 2146 16 minutes, colour				4.2 4.3	
Electricity: How to Make a Circuit (Using the Dry Cell) The basic concepts concerning electric current are explained through the use of a dry cell. The production of electricity from a dry cell and its path through a circuit are illustrated. Encyclopedia Britannica Films Multimedia Audiovisuel Inc.	No. 1718 11 minutes, colour				4.6	
Electricity Measurement Stimulations are used to demonstrate concepts of electrical pressure, current, resistance, Ohm's Law, and electrical power. The use of the kilowatt-hour meter as a recorder of electrical power usage is also demonstrated. Canadian Film Institute	Colour or black and white, 12 minutes, 1963				4.4 4.10	

THEME 4: ELECTRICAL TECHNOLOGY

		THEMES				
AUDIOVISUAL	Description	1	2	3	4	5
Electricity: Production The production of electricity is explored. Beginning with Michael Faraday's discoveries to today's massive generators, the film presents other forms of electricity production such as: chemical conversion, heat and light conversion, solar cells, thermocouples and fuel cells. Canadian Film Institute	Colour or black and white, 15 minutes, 1964				4.2	
Electromagnets: How They Work Shows the creation of an electromagnetic field by the flow of electricity through a conductor, and explains the technological advantages of electromagnets over permanent magnets. Encyclopedia Britannica Films Multimedia Audiovisual Inc.	No. 1784 11 minutes, colour				4.7	
Electromagnetism and Electric Motors: Classroom Science The passing of an electric current through a coil of copper wire wrapped around an iron core produces a magnet. Demonstrates arrangement of a group of magnets to turn an axle by the alternate attraction and repulsion of pairs of magnets. Shows the procedure for making an electric motor using wood, nails, copper wire and aluminum foil. Robinette Film BFA Film Video, Media Department Holt, Rinehart and Winston of Canada Limited	No. 10666 14 minutes, colour (IJ)				4.8	
Electronics: An Introduction Electronics uses the energy of electrons. This film follows the development of electronic devices: conductors, electric light bulbs, diode vacuum tubes, amplifiers and transistors, which are some of the electronic applications that are surveyed. A Victor and Ellen Landweber Films BFA Film Video, Media Department Holt, Rinehart and Wirston of Canada Limited	No. 11044 9½ minutes, colour				4.10	

THEME 4: ELECTRICAL TECHNOLOGY

		THEMES				
AUDIOVISUAL	**Description**	1	2	3	4	5
Exploring Electricity A comprehensive introduction to the fundamentals of electrical energy portrayed in full-color photography. The content is designed to provide students with a practical understanding of the electrically oriented environment in which they live. . Producing Electricity (CL464-1) . Transmitting Electricity (CL464-2) . Using Electricity: Heat (CL464-3) . Using Electricity: Light and Electromagnetic Energy (CL464-4) . Using Electricity: Electromagnets and Motors (CL464-5) . Experimenting with Electricity (CL464-6) Kool Louise and Galt Limited	6 full-colour sound filmstrips with teacher's guide, grades 5-9. CL464-C Complete program (6 F/S, 6 cas. and teacher's guide)				×	
Heat: The Science Alliance Program Demonstrations of how friction, chemical reactions, electrical energy, and nuclear energy produce heat. Experiments show how heat expands matter and how heat travels by conduction, convection, and radiation. T.V. Program - Teacher's Guide Provided + Student Activities Book. TV Ontario Marketing	BPN 199506 30 minutes, colour				4.9	
Heat and How We Use It The sources of heat, the way it travels and its many uses are explored in order to provide a basic understanding about heat. Reflection and absorption of heat by different materials is explained. Encyclopedia Britannica Films Multimedia Audiovisuel Inc.	No. 2059 11 minutes, colour				4.9	

THEME 4: ELECTRICAL TECHNOLOGY

		THEMES				
AUDIOVISUAL	Description	1	2	3	4	5
How to Produce Electric Current With Magnets Experiments with a magnet and battery show that electricity and magnetism are interrelated and that an electric current can produce magnetic effects. Encyclopedia Britannica Films	No. 1882 11 minutes, colour				4.2 4.7	
Learning About Electric Current (2nd Edition) Laboratory experiments and animated drawings illustrate the chemical, magnetic and heat effects of electric current. Encyclopedia Britannica Films	No 3366 15 minutes, colour				4.1	
Learning About Magnetism (2nd Edition) This film explores magnetism, its mysteries and its practical applications. Encyclopedia Britannica Films	No. 3396 14 minutes, colour				4.7	
Learning About Heat (2nd Edition) This film discusses, through laboratory demonstrations and animated episodes, the molecular basis of heat, friction, changes of states in gases, solids and liquids, the movement of heat through radiation, convection and conduction. It also discusses the energy dilemma, focusing on the decreasing amounts of fossil fuels. Encyclopedia Britannica Films	No. 3365 15 minutes, colour				4.9	
Magnetic, Electric and Gravitational Fields A series of demonstrations are used to show evidence of magnetic fields, electric fields, and gravity. Encyclopedia Britannica Films Multimedia Audiovisual Inc.	No. 1884 11 minutes, colour				4.7	
Magnetic Fields and Electric Currents - Part I The magnetic field properties of direction and strength are examined through experimentation. BFA Film Video	No. 11102 14½ minutes, colour				4.7	

THEME 4: ELECTRICAL TECHNOLOGY

		THEMES				
AUDIOVISUAL	Description	1	2	3	4	5
Magnetic Fields and Electric Currents - Part II Investigates the interaction of magnetic fields by observing the magnetic fields of permanent magnets that are attracting or repelling other magnets, and similar effects produced by electric currents. These principles are used to explain how a simple electric motor operates. BFA Film Video Holt, Rinehart and Winston of Canada Limited	No. 11103 12½ minutes, colour				4.7	
Magnetism and Electricity Explains simple electric and magnetic relationships and examines the principles of the transformer. Visual Media Resources Audiovisual Department Concordia University	17 minutes black and white MGHT, 1963 CAV875				4.3 4.7	
Magnetism and Electricity: Magnetism The Nature of Electricity Chemical Energy and Electricity Mechanical Energy and Electricity Carman Educational Associates Limited	4 filmstrips				4.2	
Magnets: The Science Alliance Program Explains how to make your own magnet and electromagnet, and demonstrates the laws of magnetism. T.V. Program - Teacher's Guide Provided + Student Activities Book. TV Ontario Marketing	BPN 199501 30 minutes, video				4.7	
Magnets and Their Uses This film explores what magnets are, what they do, and how they are used. Laboratory demonstrations and animation are used to illustrate the characteristics and properties of magnets. BFA Film Video, Holt, Rinehart and Winston of Canada Limited	No. 10105 9½ minutes, colour				4.7 4.8 4.10	

THEME 4: ELECTRICAL TECHNOLOGY

		THEMES				
AUDIOVISUAL	**Description**	1	2	3	4	5
Nuclear Power Reactor This slide set helps explain how a nuclear power station works. Students learn about its fuel bundles, calandria, fuelling machines, boilers, control rooms, turbine-generators and spent fuel bays. McIntyre Educational Media Limited	No.152303H5 Set of 10 slides, teacher's notes				4.2 4.3	
Os Mundi Film documentary on magnetism, giving scientific principles of everyday applications. Discusses present-day uses of magnetism in modern inventions and explains what modern research has discovered about magnetism. General Information	Netherlands 27 minutes black and white English	1.5			4.7 or	
Principles of Electricity Fundamentals of Electricity Principles of Magnetism Sources of Electricity Current and Pressure General Electronics School Services of Canada	ML0025 Set 5 cas/5 str.				4.2 4.3 4.4 4.5 4.6 4.7	
Renewable Energy Resources: Wind, Water and Solar Rays This program consolidates information about the many promising and exciting alternative solutions to the energy problem. Students learn how energy from the sun can supply power for heat, electricity and transportation by means of solar cells, solar towers and active or passive solar heating systems. Other sources of renewable energy are discussed - biomass, wind, falling water and tides. Each is evaluated in terms of efficiency in receiving, storing and providing energy. McIntyre Educational Media Limited	4 parts, Teacher's Guide, Library Kit. #01052-660 Filmstrips-on-Video or Sound Slides Sound Filmstrips				4.2 4.3	

THEME 4: ELECTRICAL TECHNOLOGY

		THEMES				
AUDIOVISUAL	Description	1	2	3	4	5
Safety With Electricity Simple experiments and demonstrations show the nature and sources of electricity and illustrate desirable practices with electrical equipment and appliances. Encyclopedia Britannica Films	No. 2029 10 minutes, colour				4.10	
Solar Energy: Putting Sunshine in Your Life An in-depth examination of the applications of solar energy. Explains the difference between active and passive solar-heating systems, and discusses the way each system utilizes collectors, heat-storage areas, insulation and natural convection or motorized heat pumps. McIntyre Educational Media Ltd	2 parts, Teacher's Guide, Library Kit #01022-650 Sound Slides				4.3	
Understanding Electricity Students discover what electricity is and how it works. Filmstrips average 36 frames. . What is Static Electricity? (F121-1) . What is Current Electricity? (F121-2) . How Most Electricity is Produced (F121-3) . Producing Small Amounts of Electricity (F121-4) . Electromagnets and How They Work (F121-5) . How is Electricity Used in the Home? (F121-6) . Using Electricity Safely (F121-7) Kool Louise and Galt Limited	F121-C Complete Program				x	
Public Relations Dept. Hydro Québec 75 Dorchester Street W. Montréal, Québec Catalogue of A.V. materials available on request. Teaching Kits also available.						

THEME 4: ELECTRICAL TECHNOLOGY

		THEMES				
AUDIOVISUAL	Description	1	2	3	4	5
Public Relations Dept. James Bay Development Corp. 800 de Maisonneuve East Montréal, Québec Catalogue of A.V. materials available on request.						
What is Electric Current? Points out that there is an electric current only when electricity has a complete circuit through which to flow; that electricity can flow in either direction; that electric current is a flow of electric charges which are found in all materials. Encyclopedia Britannica Films Multimedia Audiovisue, Inc.	No. 1880 13 minutes, colour				4.2 4.5	

THEME 5

TECHNOLOGY IN THE WORLD OF WORK TIME: 1000 minutes

GENERAL OBJECTIVE: The pupil should be capable of explaining the general organization of a factory, the principles of mass production, and the influence of manufactured goods on various activities of world of work.

TERMINAL OBJECTIVES:

The pupil should be able:

5.1 To identify certain regional industrial establishments and to classify them according to the sector of economic activity to which they belong.

5.2 To describe the purpose and to identify the advantages and the disadvantages of mass production.

5.3 To describe briefly the forming procedures listed under learning content. (Optional)

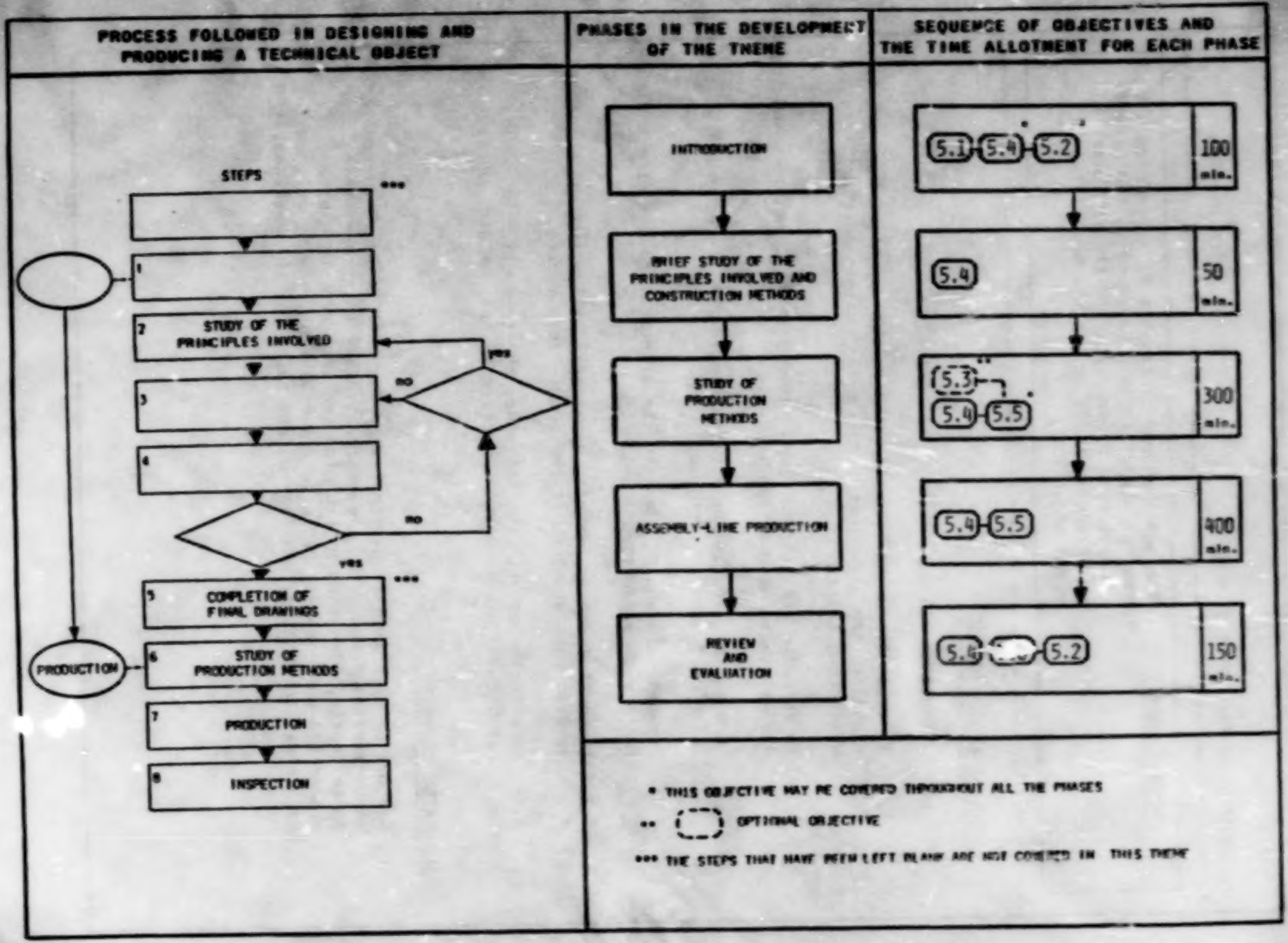
5.4 To enumerate and to identify the principal phases of establishing a mass production line.

5.5 To participate in planning a mass production run and to occupy several work stations in the production process.

5.6 To describe briefly the influence the production of manufactured goods has on various sectors of the world of work.

LEARNING CONTENT:

Sectors of activities: primary, secondary, tertiary--hand-crafted work--mass-produced work: advantages, disadvantages--forming procedures (optional)--steps in planning and implementing a mass-production unit--common techniques: measuring, laying out, machining, forming, assembling--safety rules for the workshop.


PROCESS FOLLOWED IN DESIGNING AND PRODUCING A TECHNICAL OBJECT
PHASES IN THE DEVELOPMENT OF THE THEME
SEQUENCE OF OBJECTIVES AND THE TIME ALLOTMENT FOR EACH PHASE
STEPS
***
1
2 STUDY OF THE PRINCIPLES INVOLVED
yes
no
3
4
no
yes
***
5 COMPLETION OF FINAL DRAWINGS
PRODUCTION
6 STUDY OF PRODUCTION METHODS
7 PRODUCTION
8 INSPECTION
INTRODUCTION
BRIEF STUDY OF THE PRINCIPLES INVOLVED AND CONSTRUCTION METHODS
STUDY OF PRODUCTION METHODS
ASSEMBLY-LINE PRODUCTION
REVIEW AND EVALUATION
5.1
*
5.4
*
5.2
100 min.
5.4
50 min.
**
5.3
*
5.4
5.5
300 min.
5.4
5.5
400 min.
5.6
[illegible]
5.2
150 min.

* THIS OBJECTIVE MAY BE COVERED THROUGHOUT ALL THE PHASES

** ( ) OPTIONAL OBJECTIVE

*** THE STEPS THAT HAVE BEEN LEFT BLANK ARE NOT COVERED IN THIS THEME

INTRODUCTION TO TECHNOLOGY

THEME: TECHNOLOGY IN THE WORLD OF WORK

GENERAL OBJECTIVE
The pupil should be capable of explaining the general organization of a factory, the principles of mass production, and the influence of manufactured goods on various activities of the world of work.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
5.1 Without using reference material, the pupil should be able to identify certain regional industrial establishments and to classify them according to the sector of economic activity to which they belong. (50)	Sectors of activity: - primary sector: .mining .fishing .agriculture .energy - secondary sector: .industrial manufacturing - tertiary sector: .services .recreation	. Using transparencies, show the characteristics of each sector of economic activity. (See Appendix 14.) . Using slides, have pupils identify regional businesses and classify them.	. Following a question and answer session, pupils should classify businesses in the economic sectors to which they belong, on a worksheet.	Formative Evaluation . Assess pupils' oral responses. . Evaluate the worksheets. Summative Evaluation Objective test item: - Match the following types of business with the appropriate economic sectors of activity. Note: A reminder to the teacher that summative evaluation takes the form of a test or examination given on completion of a theme and/or at the end of a term.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
5.2 Having participated in assembly-line production, the pupil should be able to describe the purpose and to identify the advantages and the disadvantages of mass production. (20)	Nature of hand-crafted and mass-produced work. Characteristics of mass-produced work (advantages and disadvantages): - Increase in: . quality of work . speed of operations . speed of learning of tasks (operations) - decrease in: . scrap . cost of production . specialists needed - workers' lack of interest - work stoppages - costly mistakes (errors) - difficulties of conversion	. Using a variety of products, explain the difference between hand-crafted and mass-produced work. . Having pupils identify the advantages and disadvantages of assembly-line production. Return to this subject after pupils have worked in a production line.	. Question and answer session. . In a question and answer session, pupils should identify and record some of the advantages and disadvantages of assembly-line production.	Formative Evaluation . Assess pupils' oral responses. . Evaluate their written work. Summative Evaluation Objective test item: - Identify the advantages of assembly-line production, giving true or false answers.
5.3 Given simple technical objects, the pupil should be able to describe briefly the forming procedures listed under learning content. (Optional) (50)	Forming procedures: -forging -stamping -folding -centring -casting -turning (spinning).	Give an appropriate audiovisual presentation. . Following the presentation, analyze a number of objects. . Give pupils a summary chart of the procedures covered and go over it with them.	. In a question and answer session, pupils should identify the forming procedures used to shape given objects. . Pupils should read the chart of the procedures covered.	Formative Evaluation . Assess pupils' responses during the analysis to ascertain how much they have understood. Summative Evaluation Objective test item: - Identify the following names using illustrations and/or descriptions.

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
5.4 Using written reference material, the pupil should be able to enumerate and to identify the principal phases of establishing a mass-production line. (50)	Planning the production process: - study of designs - work out the manufacturing process - locate . work stations . machinery . storage of materials - design . templates . set-ups.	It is recommended that Objectives 5.4 and 5.5 be covered at the same time.		Formative Evaluation . Assess pupils' oral responses
		. Briefly review the design and production procedure for making a prototype.	. Question and answer session.	. Evaluate the production specifications for a part.
		. Show pupils a pre-tested prototype and briefly explain the procedure to be followed.		. Evaluate the design and production of the template. . Evaluate pupils' comprehension by having them repeat some of the demonstrations or explanations.
	The production process: - machining and forming - inspection - assembly - final inspection - packing (optional).	. Briefly analyze the principles and construction of the prototype.	. Pupils should take part in the analysis of the prototype in a question and answer session.	. Evaluate tasks done at the work stations.
		. Have pupils briefly identify the steps followed in mass producing this product.	. Question and answer session.	. Evaluate the assembling and finishing of the product.
5.5 For a simple prototype, the pupil should be able to participate in planning a mass production run and to occupy several work stations in the production process. (650)	Steps in planning and implementing a mass production unit: Normal techniques: - measuring - laying out - machining - forming - assembling	. Give pupils a summary chart and go over it with them.	. Pupils should read the summary chart of the steps in planning and implementing a mass-production unit.	Summative Evaluation Objective test item: - Put in the correct order the steps in the planning and implementation of a mass production unit.
		. Present detail and assembly drawings of the prototype.	. In a question and answer session, pupils should interpret the drawings of the prototype.	
	Safety rules for the workshop.			

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
		. Choose a simple part of this prototype and have pupils make up production specifications.	. Each pupil should make up production specifications for a simple part and the class should then evaluate them.	Different types of short-answer test items: - Briefly explain what is involved in the study of drawings. - Explain the purpose of inspection. - Explain the purpose of a template.
		. Have pupils discover the reason for having templates and mock-ups by giving them examples.		
		. Give pupils production specifications and have them interpret them.	. In a question and answer session, pupils should interpret the production specifications for other parts of the product.	
		. Using the blackboard, briefly go over the process of arranging work stations, tooling up, and obtaining the materials to be used.	. Question and answer session.	
		. Based on a typical arrangement found in a factory, organize the classroom to be able to carry out demonstrations and to run a mass-production unit.		
		. Using the production specifications, have pupils design and make a template for a simple part (a cutting template for example).	. In teams, pupils should design and make a template for a simple part. Note: This can be given as homework.	

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
		. The pupils' task will be easier if the templates are made out of cardboard.		
		. Using tools, templates, and mock-ups, demonstrate the different machining and forming operations that will be used.	. Pupils should observe and participate in the demonstrations.	
		Insist on safe handling of tools.		
		. Determine the tasks each pupil will do and organize the handling and flow of parts around the workshop.	. Question and answer session.	
		. Begin assembly-line production by having pupils make one example of each part (testing the production cycle).	. Pupils should occupy a work station and make a sample part using tools, templates, and mock-ups. This part should be checked before continuing production.	
		Together with the inspector (a pupil), check the quality of the sample parts and make changes as needed.		
		. Using assembly specifications, demonstrate the assembling of parts and the finishing of the object.	. Pupils should observe and take part in the demonstrations.	

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
		Some of the assembly operations can be done in the production chain. However, it is preferable to have teams of several pupils assemble one object completely. This saves a considerable amount of time.	. Using assembly specifications, assemble and finish the object. . Adjust and calibrate using standard measures, if necessary.	

TERMINAL OBJECTIVES	LEARNING CONTENT	TEACHING STRATEGIES	LEARNING ACTIVITIES	EVALUATION PROCEDURES
5.6 The pupil should be able to describe briefly the influence the production of manufactured goods has on various sectors of the world of work. (50)	Primary sector: - production of primary materials: . metal . wood . mineral products - production of foods: . agriculture . animal breeding and raising . fishing . hunting - companies producing energy. Secondary sector: . production of semi-finished and finished products. · Tertiary sector: - government: . public services and para-public services - financial institutions: . banks, caisses . insurance companies - advertising firms - transportation companies - wholesale and retail trade - after-sales service.	. Drawing on pupils' experiences, have them identify the functional components of a sample factory and make a diagram of these on the blackboard. . Have pupils identify the different services and operations that fall into the input and output categories. . Complete the diagram and give copies to pupils. (See Appendix 15.) This exercise may be modified by using coloured cardboard to identify the components of a factory and input and output (operations and services). Pupils can put the pieces of cardboard on the notice board as the activity unfolds.	. Question and answer session. OR . In a question and answer session, pupils should make a diagram of a model factory's organization and identify the impact the factory has on the different sectors of activity in the work world.	Formative Evaluation . Assess pupils' oral responses. Summative Evaluation Objective test item: - Use the following list of names to complete the diagram of a model factory's organization in terms of the different sectors of activity in the work world.

THEME 5: TECHNOLOGY IN THE WORLD OF WORK

REFERENCE MATERIALS		THEMES				
MONOGRAPHS	Remarks	1	2	3	4	5
Ayensu, E. ed. The Timetable of Technology. New York: Hearst Books, 1982.						x
Bame, E. A. and P. Cummings. Exploring Technology. Worchester, Mass.: Davis Publications, 1980.						x
Cavendish, Marshall. The Marshall Cavendish Encyclopedia of Science and the Future. Volume 4 Technology Tomorrow. Freeport, Newport: Marshall Cavendish Corporation, 1982.	General information					x
Devore, P. Technology: An Introduction. Worcestor, Mass.: Davis Publications, 1980.						x
Fales, J., E. Sheets, G. Mervich and J. Dinan. Manufacturing: A Basic Text for Industrial Arts. Bloomington, Ill.: McKnight Publishing Company, 1980.	Generally applicable to the whole module. Excellent source for projects - methodology on how to develop the steps of conceptualizing, presenting and developing the manufacturing process.					x
Jambro, D. J. Introduction to Manufacturing. Albany, New York: Delmar Publishers, 1982.						x
Kazanas, H. C., G. E. Baker and T. Gregor. Basic Manufacturing Processes. New York: McGraw-Hill, 1981.						x

THEME 5: TECHNOLOGY IN THE WORLD OF WORK

		THEMES				
MONOGRAPHS	Remarks	1	2	3	4	5
Lux, D. C. and W. E. Ray. The World of Manufacturing. Bloomington, Ill.: McKnight & McKnight Publishing Company, 1985.						x
Naisbitt, John. Megatrends: Ten New Directions Transforming Our Lives. New York: Warner Books Edition, 1984.						5.6
Toffler, Alvin. Future Shock. New York: Bantam Books, 1970.						5.6
Toffler, Alvin. The Third Wave. New York: Bantam Books, 1980.						5.6

THEME 5: TECHNOLOGY IN THE WORLD OF WORK

AUDIOVISUAL	Description	THEMES 1	2	3	4	5
Eggs to Market: The Story of Automated Egg Processing The film shows the different stages in the processing of eggs for market consumption. It shows how automation can bring fresh eggs to the market in less than 24 hours after they have been laid. BFA Film Video, Media Department Holt, Rinehart and Winston of Canada Limited	No. 10111 11 minutes, colour					5.6
The Factory: How a Product Is Made The manufacturing of a toy is followed from the original concept, design, experimental development, engineering, production assembly to the sale in a retail store. BFA Film Video, Media Department Holt, Rinehart and Winston of Canada Limited	No. 10016 14 minutes, colour					5.2 5.4
Food for the City: Produce The film shows how produce, in the form of carrots, makes its way from the farmer's fields to the processing stage and to its final destination, the market. BFA Film Video, Media Department Holt, Rinehart and Winston of Canada Limited	No. 10198 12 minutes, colour					5.5
How the Chips Are Down The influence of the silicon chip, the microprocessor, in modern industry is the subject of this film. Cameras show how miniature computers are made, why they were invented, their present uses, and their probable impact on the world of tomorrow. Canada, BBC Television Distributors	50 minutes, colour Film (78)					x
Packaging Presents old methods of packaging versus new ones and illustrates them with such products as Hinds honey, almond cream, and soap. The saving in time is indicated in percentages. Canadian Film Institute	10 minutes, silent film					5.5 5.6

THEME 5: TECHNOLOGY IN THE WORLD OF WORK

		THEMES				
AUDIOVISUAL	Description	1	2	3	4	5
Phillips, An Industry The film traces the beginnings of Philips from a small weaving mill to a world-wide manufacturing firm, giving a portrait of a modern industry, including research, product development, advertising, styling, quality control, servicing, distribution, and vocational training. Association Film Limited	24 minutes, colour					x
The Quiet Revolution The film deals with automation on the factory floor in the form of mechanized fork-trucks, reach-trucks and tow-tractors. The aim is to show the revolution in material handling. British Government Offices in Canada Canadian Film Institute	23 minutes, colour					5.6
The Robots are Coming The employment of robots in industry, welding, painting, and casting is the subject of this film. Issues such as the labor threat are examined, and insight into the research dealing with artificial intelligence is provided. Canada - BBC Television Distributors	50 minutes, colour Film (79)					x
The Story of Productivity This film dramatizes the inventions and events which have contributed to the industrial Revolution in the United States. It centres on a "sunburst" composed of 10 "rays," or realms of progress, involving 157 important inventions and events. The camera picks out representative items on the sunburst and then moves away to dramatize the story of the inventors whose inventions changed our lives. Association Films Limited	30 minutes, colour					x

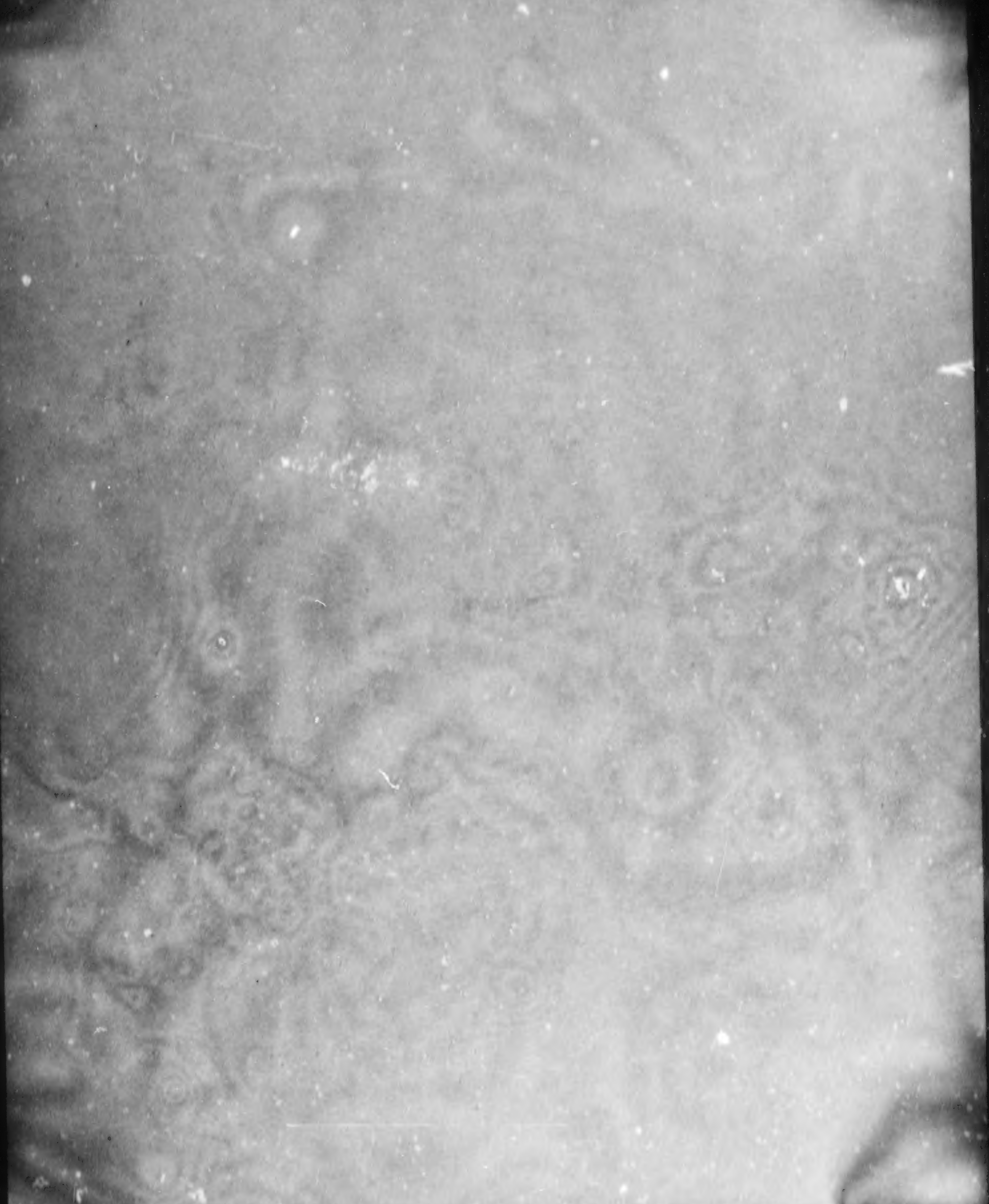
THEME 5: TECHNOLOGY IN THE WORLD OF WORK

AUDIOVISUAL	Description	THEMES 1	2	3	4	5
It's Swish This film shows the wide and varied uses of modern plastic, from providing nylon ropes for mountaineering to protecting components in rockets, and from plasticized paint and polystyrene in school art lessons to special medical equipment. This film concentrates on the methods used in manufacturing, design, and research work. British Production. Canadian Film Institute	37 minutes, colour, 1967					5.6
This Automation Age An explanation of automation and the benefits and problems it can bring. Animated techniques and illustrated examples of automation's applications in different walks of life are used to explain the meaning of automation. Canadian Film Institute	33 minutes, colour					5.4
Weird World of Robots This film provides visual evidence of the kind of performance given by stimulator and augmentor robots. The first mimics human performance, the second assists man in performing tasks. The performance of robots in today's society and in the future are discussed. McGraw-Hill Films, Limited	Code 648001-1 26 minutes, colour					5.5 5.6
The World of Automation The principles and advantages of automation, the basis of modern industry and commercial progress, are outlined in this film, which combines cartoon and live-action sequences. British Government Offices in Canada Canadian Film Institute	11½ minutes, colour video					5.4 5.5

THEME 5: TECHNOLOGY IN THE WORLD OF WORK

		THEMES				
AUDIOVISUAL	**Description**	1	2	3	4	5
Approaching Automation The film demonstrates the advantages of automated production methods for the smaller manufacturer. It shows how new and more economic processes can be introduced at a low cost in a move towards full automation. British Government Offices in Canada Canadian Film Institute	TV video 21 minutes, colour					5.4
Behind the Scenes at the Supermarket This film introduces the viewer to the behind-the-scene activities in a supermarket. It shows how food is brought to the market in trucks, how it is processed and stored, and finally, displayed for customers. BFA Film Video, Media Department Holt, Rinehart and Winston of Canada Limited	No. 10027 11 minutes, colour					5.6
Destination Unknown (Mit Unbekanntem Ziel) This film gives a comprehensive insight into the use of plastics in technology, medicine and everyday life. Austrian production. Canadian Film Institute	21 minutes, colour, English					5.6
Eat, Drink and Be Merry A film illustrating the importance of food preservation. The film starts with Napoleon's campaigns and the origin of food preservation and continues up to experiments in refrigeration, the development of the thermos flask, and the use of liquid oxygen and hydrogen as rocket fuel, both by-products of the refrigeration industry. Canada, BBC Television Distributors	Video	x				x

APPENDICES



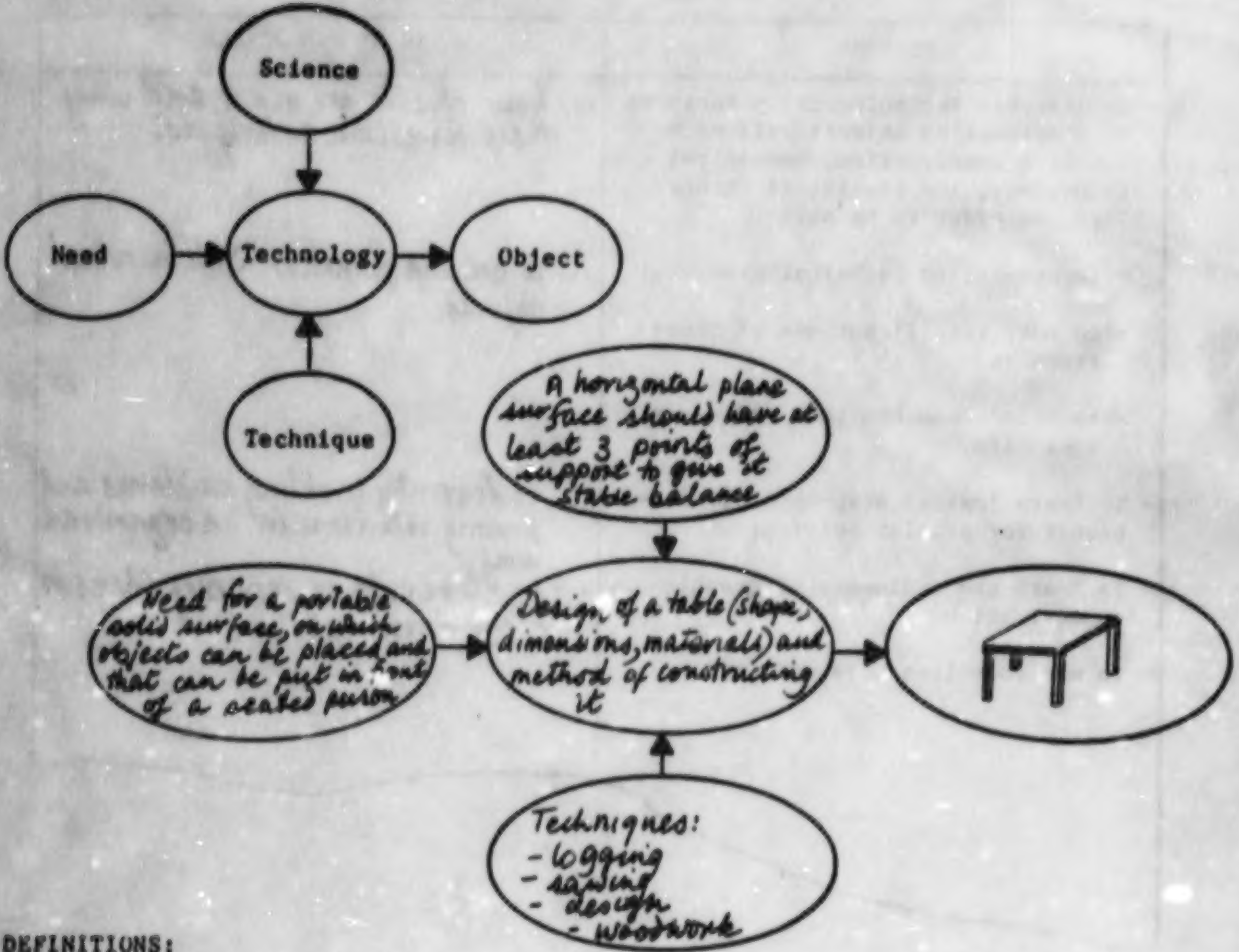
APPENDIX 1

WHY ARE YOU TAKING AN INTRODUCTION TO TECHNOLOGY COURSE?

REASONS	IN MY OWN WORDS
- To discover technological principles by constructing objects related to building/construction, mechanical technology, and electrical technology, in order to be able:	... how objects are made and why they function as they do.
- to understand technical products;	... to become familiar with technical objects.
- to make intelligent use of these products;	
- to understand how they influence your life.	
- To learn logical step-by-step techniques for problem solving;	... to learn by tackling problems and finding solutions in an organized way.
- To learn the rudiments of graphic communication;	... to learn to express my ideas in clear drawings.
- To use your inventive ability.	

APPENDIX 2

TECHNOLOGY - TECHNIQUE - SCIENCE

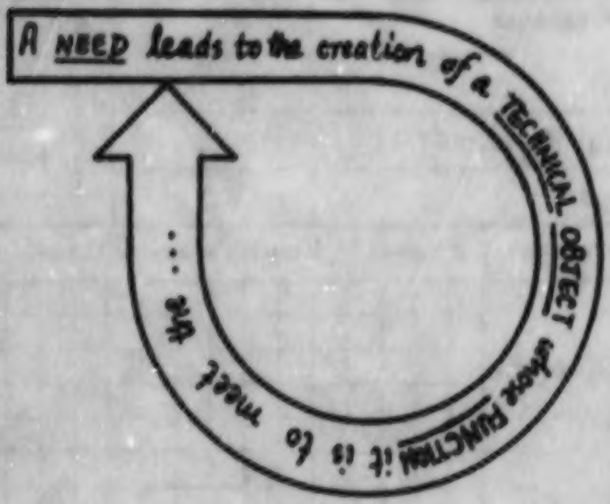

Science
Need
Technology
Object
Technique
A horizontal plane surface should have at least 3 points of support to give it stable balance
Need for a portable solid surface, on which objects can be placed and that can be put in front of a seated person
Design of a table (shape, dimensions, materials) and method of constructing it
Techniques:
- logging
- sawing
- design
- woodwork

DEFINITIONS:

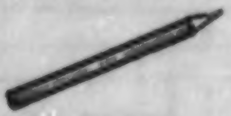
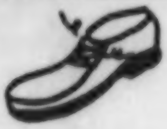
Science*	Technology*	Technique [1]
Definition from an up-to-date dictionary. *Pure science	Definition from an up-to-date dictionary. *Applied Science	Definition from an up-to-date dictionary.

APPENDIX 3

NEED - TECHNICAL OBJECT - FUNCTION

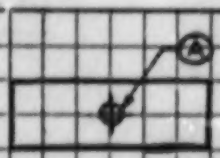

A NEED leads to the creation of a TECHNICAL OBJECT whose FUNCTION it is to meet the ...

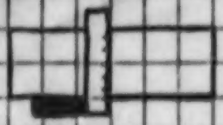
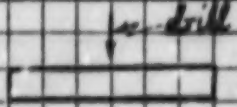
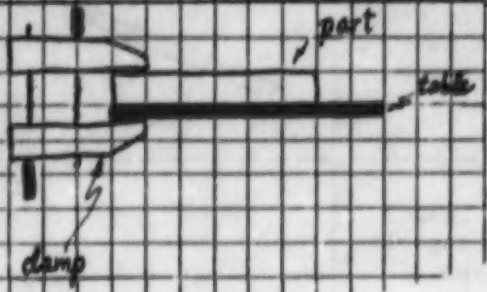
Fill in the blank spaces on the following chart.

NEED	OBJECT	FUNCTION
To make lines on a sheet of paper that can be erased with an eraser.		
To sit with feet placed on the floor and legs in a vertical position.		To enable a person to sit with feet placed on the floor and legs in a vertical position.
		To support the foot and protect it from injury.

APPENDIX 4

SAMPLE PRODUCTION SPECIFICATIONS

PRODUCTION SPECIFICATIONS				NAME:
Object	Shelf			
Materials	Poplar Plywood (13)			
Part	Support	No.	2	

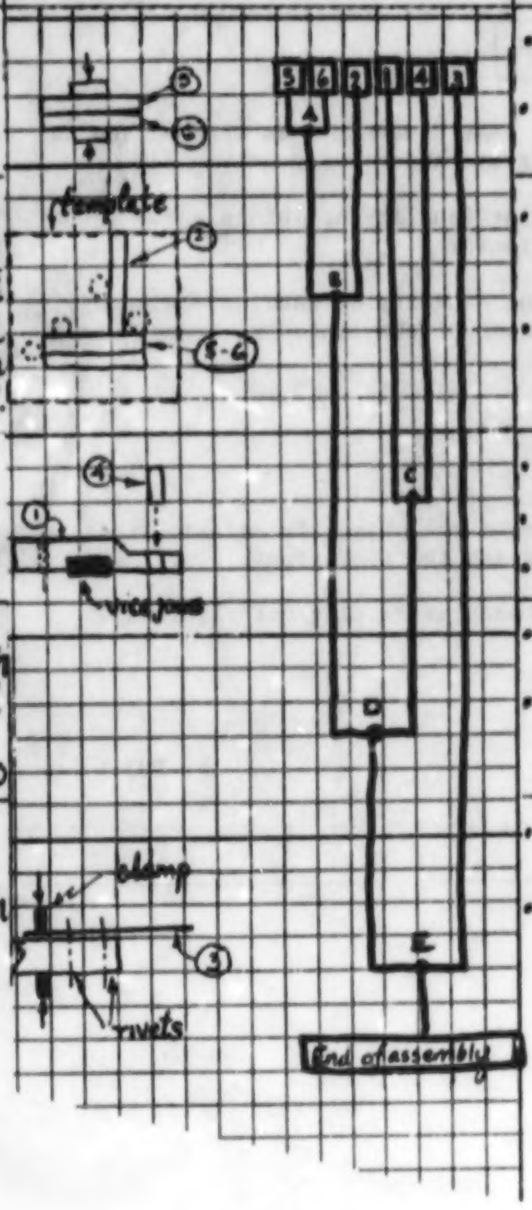
No.	Steps	Operations	Schematic Drawings and Information	Equipment
1	Sawing	-Measure (285) -Cut		• Measuring tape • Hand saw
2	Laying Out	• Measure • Square		• Measuring tape • Square
3	Punching	Ⓐ		• Punch • Hammer
4	Drilling	• Prepare the drill • Clamp the part • Drill		• Drill • No.12 drill bit • Clamp
5	Sanding			

APPENDIX 5

SAMPLE ASSEMBLY SPECIFICATIONS

ASSEMBLY SPECIFICATIONS		NAME:	
Object	Unknown object	No.	10

No.	Steps	Operations	Schematic Drawings and Information	Equipment
A	Bonding of Parts 5 and 6	• Glue • Clamp		• C-clamp • Wood blocks
B	Detachable fastening of Part 2 with Part 5-6.	• Place parts according to the template. • Screw Part 2 together with Screws 7 and 8.		• Template • Screwdriver
C	Placing Block 4 on Part I	• Put the part in position for hammering		• Hammer • Wood block • Vice
D	Detachable fastening of 5-6-2 with 1-4	Bolt part together with Bolt 9 and Locking Mechanism 10		• Clyburn wrench • 6 mm wrench
E	Rigid connection of Parts 1-4.	• Clamp Part 3 • Rivet with 2-10 mm pop rivets.		• Vice jaws • Riveter



APPENDIX 6

SHEET FOR EVALUATING A PROTOTYPE MADE IN AN INTRODUCTION TO TECHNOLOGY CLASS

PUPIL'S NAME ______________________________

GROUP ____________ OBJECT MADE ______________________

CONSTRUCTION

1. Has the same dimensions as those given in the diagrams and drawings — out of 20 ○
2. Assembling (quality of joints and connections). — out of 20 ○
3. Finishing (quality of sanding, painting, application of the finishing coats, etc.) — out of 20 ○

FUNCTION

1. Function of the object in relation to the need and the conditions. — out of 40 (25) ○
2. Testing and calibrating (if required) — (15) ○

TOTAL — out of 100 ○

REMARKS ______________________________

____

____

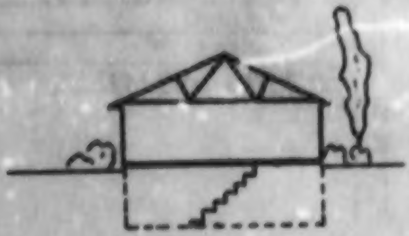
TEACHER

APPENDIX 7

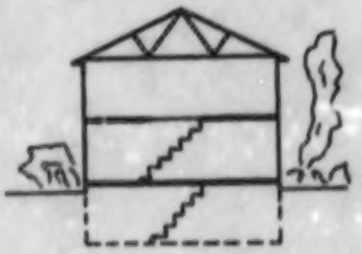
PRINCIPAL TYPES OF RESIDENCES

Complete the sheet by putting the appropriate names under the pictures.

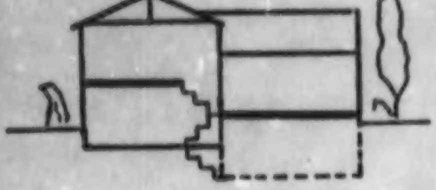
- .bungalow
- .two-storey house
- .split-level
- .one-and-a-half storey house
- .two-family house
- .row house
- .semi-detached house
- .apartment
- .country cottage
- .mobile home
- .trailer
- .houseboat



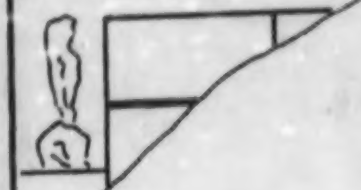
Bungalow



Two-storey house



Split-level

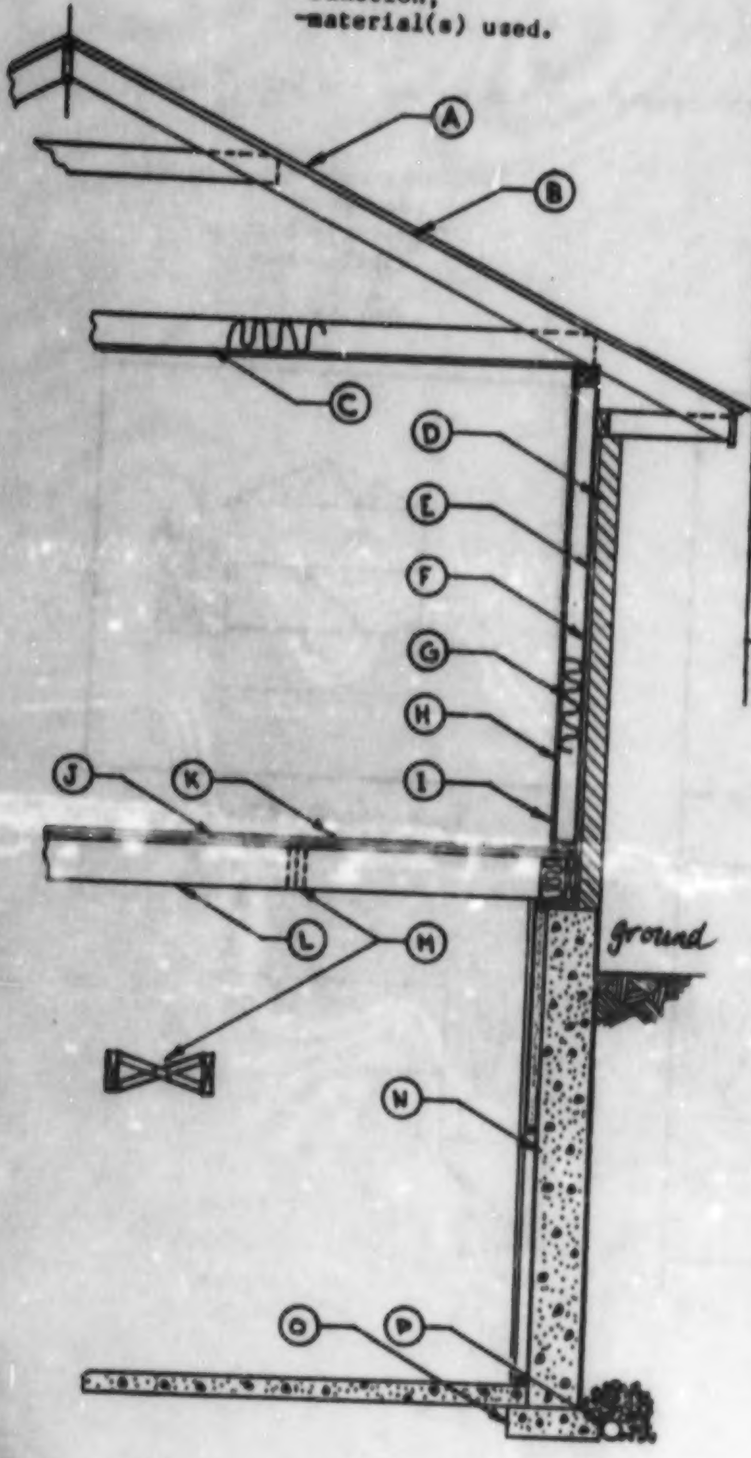


THE COMPONENT PARTS OF A HOUSE

APPENDIX 8

For each part, write in the:

-name,
-function,
-material(s) used.

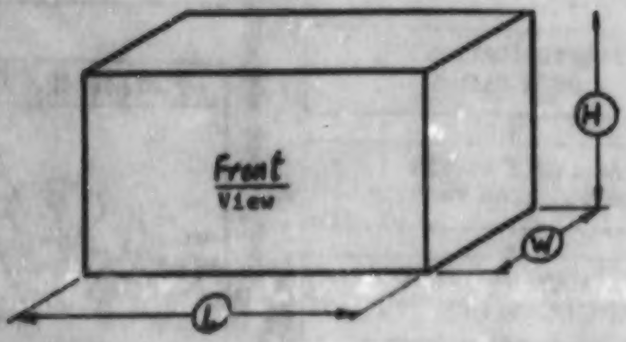


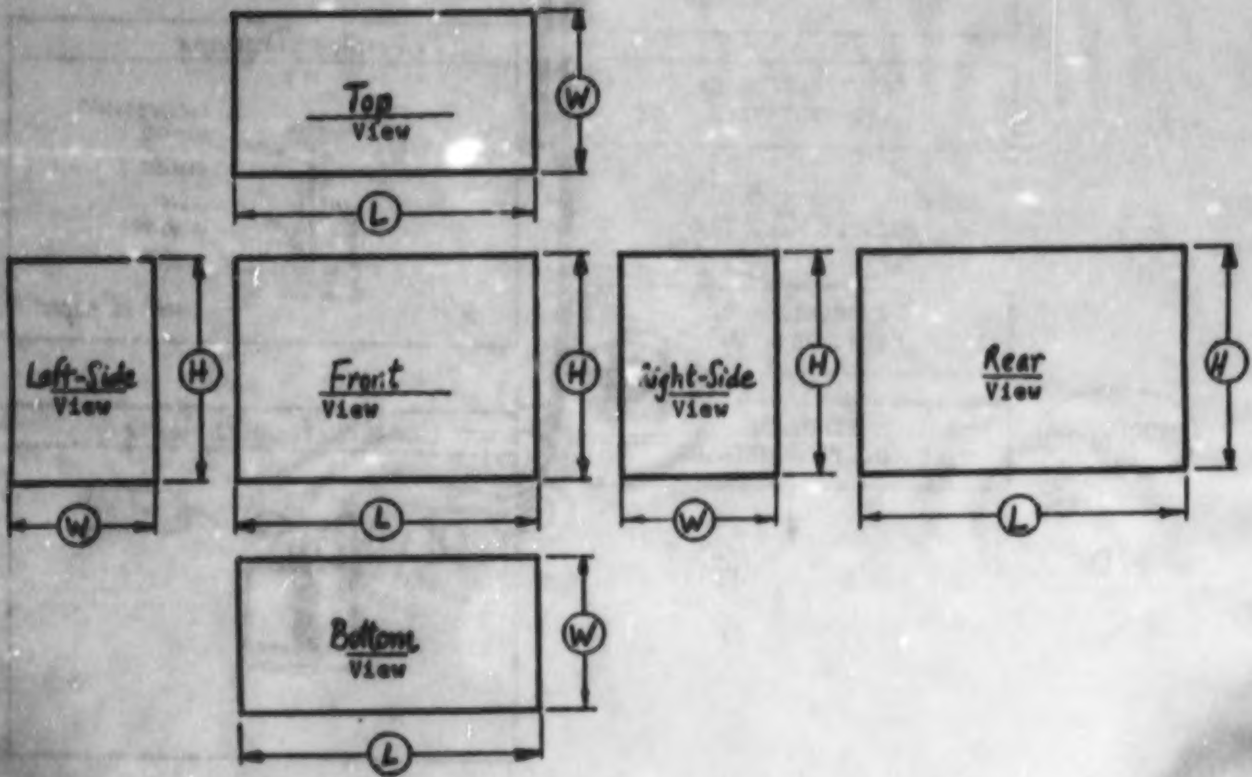
A	Siding Support for the roof facing Plywood
B	Rafters Roof support Wood
C	Joists Ceiling support Wood
D	Wall facing Weatherguard Wood, stone, brick, aluminum
E	Air space Ventilation and insulation —
F	Siding Exterior covering and insulation Fibre board
G	Thermal insulation Insulation Fibreglass
H	Vapour barrier
I	

APPENDIX 9

ORTHOGRAPHIC PROJECTION

- Identify each of the views.
- Identify the dimensions indicated by arrows, putting the appropriate letters in the circles (height H, width W, length L).
- Colour the contour of each view, using the same colours as those used on the model.


Front
View
H
W
L

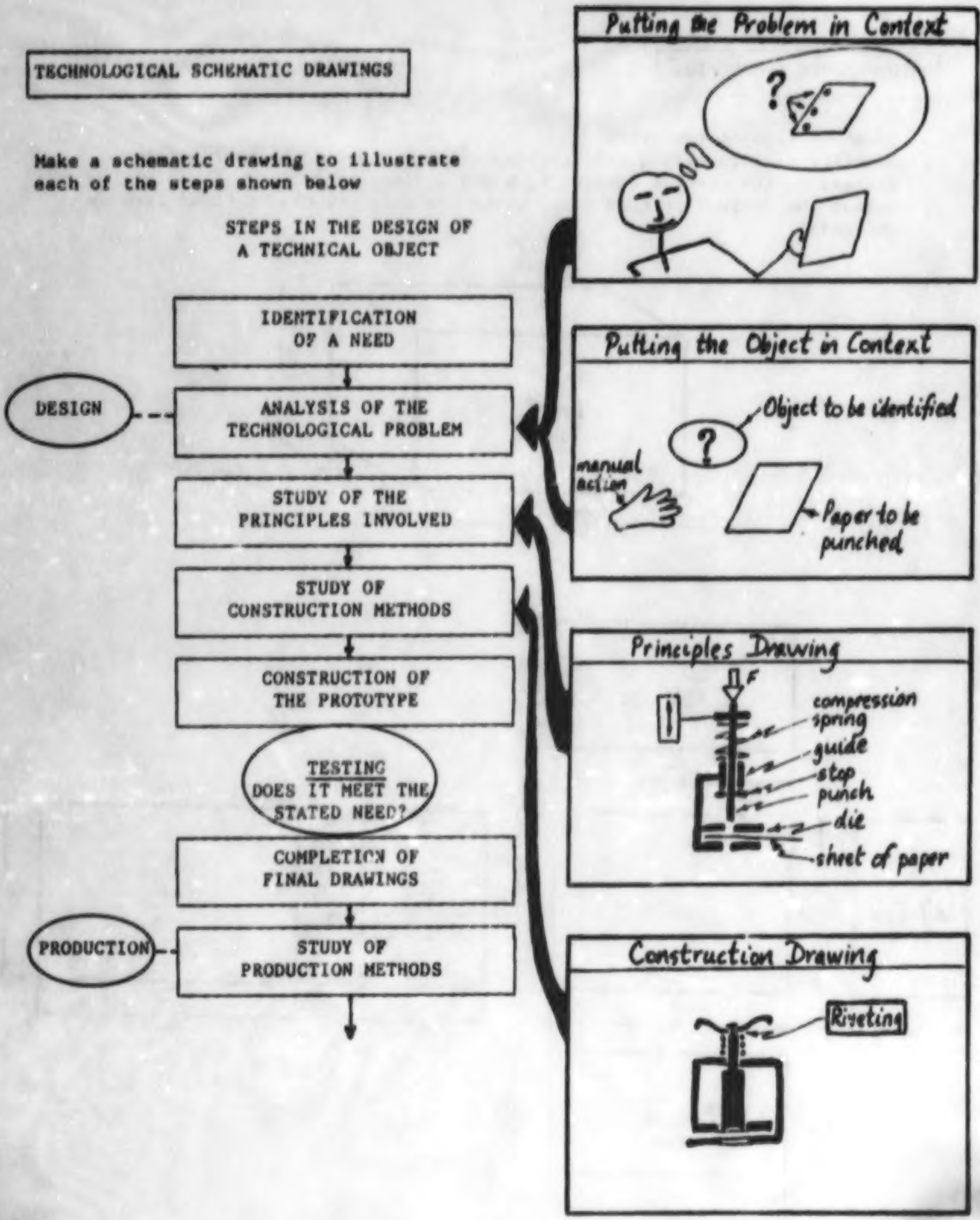

Top
View
W
L
Left-Side
View
H
W
Front
View
H
L
Right-Side
View
H
W
Rear
View
H
L
Bottom
View
W
L

APPENDIX 10

TECHNOLOGICAL SCHEMATIC DRAWINGS

Make a schematic drawing to illustrate each of the steps shown below

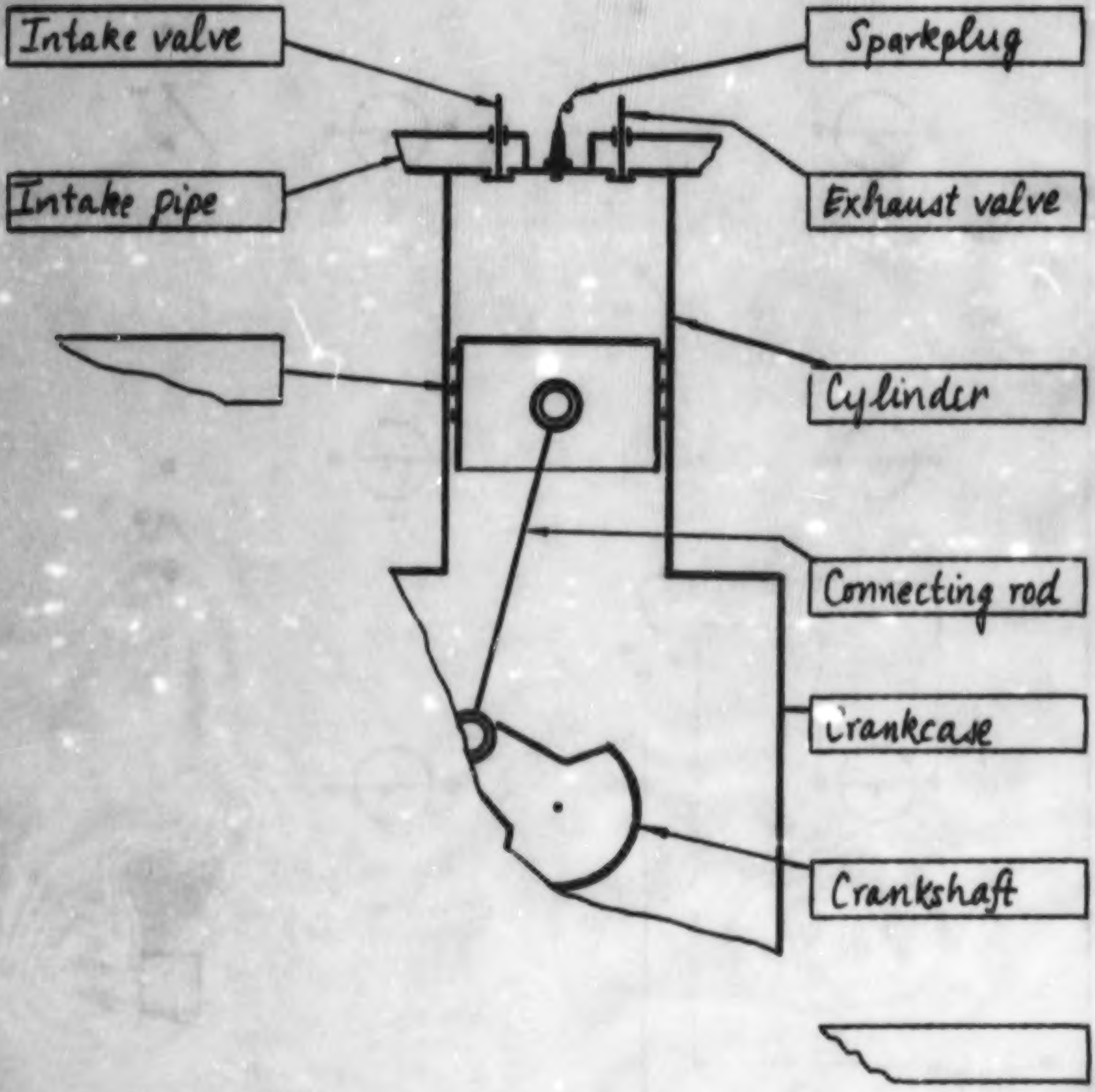
STEPS IN THE DESIGN OF A TECHNICAL OBJECT


IDENTIFICATION OF A NEED
DESIGN
ANALYSIS OF THE TECHNOLOGICAL PROBLEM
STUDY OF THE PRINCIPLES INVOLVED
STUDY OF CONSTRUCTION METHODS
CONSTRUCTION OF THE PROTOTYPE
TESTING
DOES IT MEET THE STATED NEED?
COMPLETION OF FINAL DRAWINGS
PRODUCTION
STUDY OF PRODUCTION METHODS
Putting the Problem in Context
?
Putting the Object in Context
Object to be identified
?
manual action
Paper to be punched
Principles Drawing
F
compression spring
guide
stop
punch
die
sheet of paper
Construction Drawing
Riveting

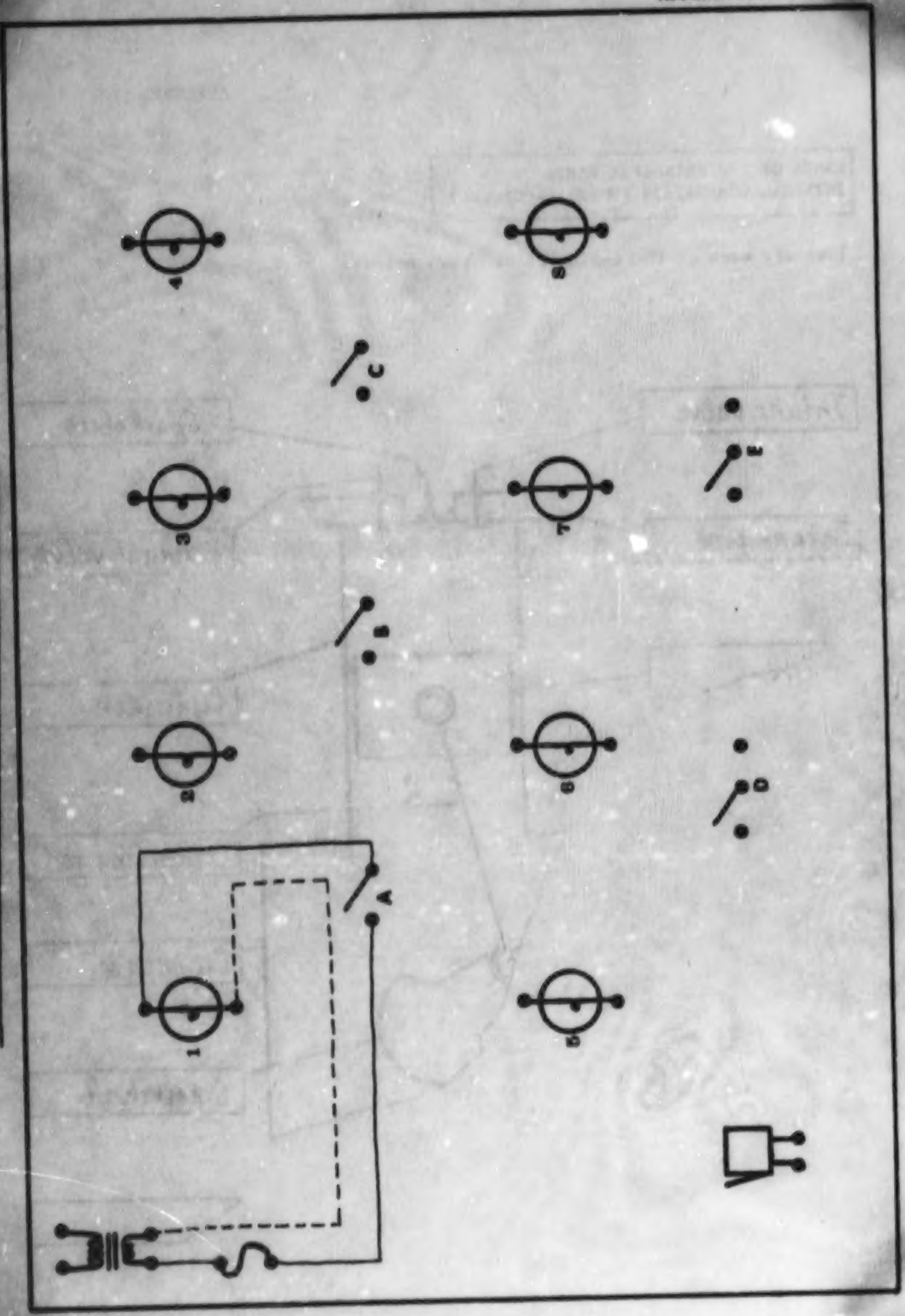
APPENDIX 11

NAMES OF THE PRINCIPAL PARTS OF AN INTERNAL COMBUSTION ENGINE (4 CYCLES)

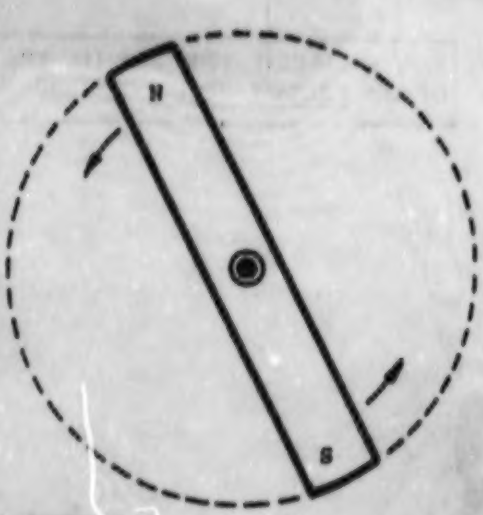
Identify each of the engine parts drawn below:


Intake valve
Sparkplug
Intake pipe
Exhaust valve
Cylinder
Connecting rod
Crankcase
Crankshaft

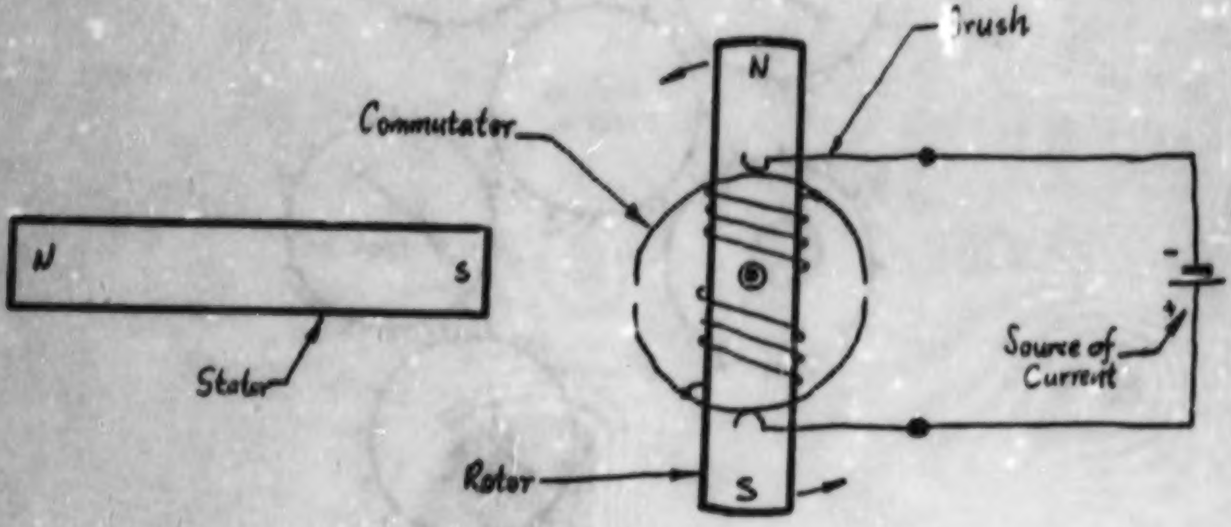
EXAMPLE OF A SCHEMATIC DRAWING OF A SIMPLE CIRCUIT ON A TEST PANEL


1
2
3
4
5
6
7
8
A
B
C
D
E

SAMPLE DIAGRAM OF THE PRINCIPLES OF AN ELECTRIC MOTOR THAT RUNS ON DIRECT CURRENT



LAW OF MAGNETIC POLES: Unlike poles attract and like poles repel

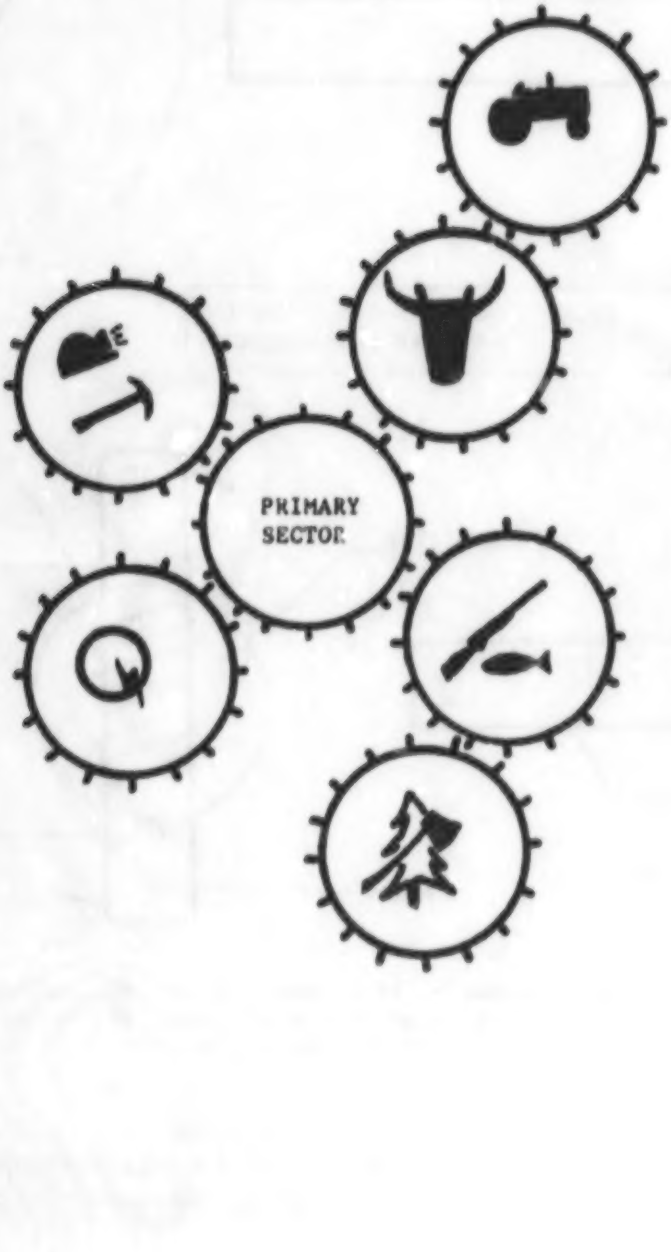

Brush
N
Commutator
N
S
-
+
Source of Current
Stator
Rotor
S

In the above example, if we could change the polarity of one of the two magnets when they reach their attraction position (horizontal), we would have an electric motor.

This is made possible by the use of an electromagnet, two brushes, and two commutators which change the polarity at the right time.

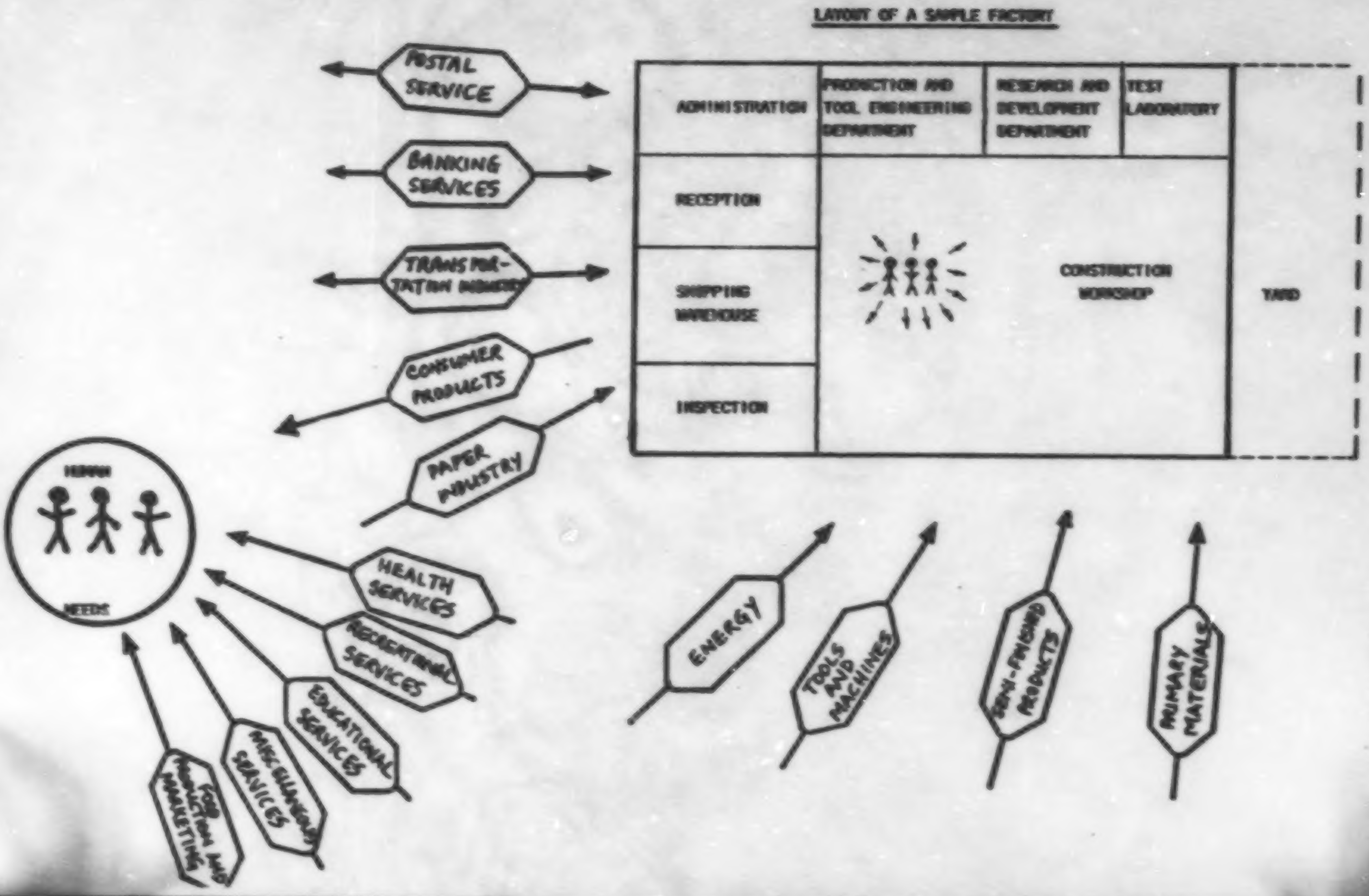
APPENDIX 14

SAMPLE ILLUSTRATION SHOWING THE CHARACTERISTICS OF THE PRIMARY SECTOR OF INDUSTRY


PRIMARY SECTOR

APPENDIX 15

RELATIONSHIPS BETWEEN THE FACTORY AND OTHER SECTORS OF ECONOMIC ACTIVITY


LAYOUT OF A SAMPLE FACTORY
ADMINISTRATION
PRODUCTION AND TOOL ENGINEERING DEPARTMENT
RESEARCH AND DEVELOPMENT DEPARTMENT
TEST LABORATORY
RECEPTION
SHIPPING WAREHOUSE
INSPECTION
CONSTRUCTION WORKSHOP
YARD
POSTAL SERVICE
BANKING SERVICES
TRANSPORTATION INDUSTRY
CONSUMER PRODUCTS
PAPER INDUSTRY
HUMAN NEEDS
HEALTH SERVICES
RECREATIONAL SERVICES
EDUCATIONAL SERVICES
MISCELLANEOUS SERVICES
FOOD PRODUCTION AND MARKETING
ENERGY
TOOLS AND MACHINES
SEMI-FINISHED PRODUCTS
PRIMARY MATERIALS

BIBLIOGRAPHY

BIBLIOGRAPHY

Baydock, F., D. Bothing, K. Osborne and S. Stankovic. **Introduction à la technologie.** N.p.: La Fondation d'études du Canada, November 1977.

Buban, P. and M. Schmitt. **Understanding Electricity and Electronics.** 3rd ed. New York: McGraw-Hill, 1975.

Groneman, C. H. and J. L. Feirer. **General Industrial Education.** 5th ed. New York: McGraw-Hill, 1974.

Lux, D. G. and W. E. Ray. **The World of Manufacturing.** Bloomington, Illinois: McKnight and McKnight, 1971.

Québec. Ministère de l'Éducation. Direction générale des programmes. **Introduction to Technology, Basic Concepts of Schematic Drawing, Mechanics, and Electricity.** (Curriculum Guide, Secondary School, Code: 16-4888-02A). Québec: ministère de l'Éducation, 1987.

Québec. Ministère de l'Éducation. **The Schools of Québec - Policy Statement and Plan of Action.** Code: 49-1070A. Québec: Éditeur officiel du Québec, 1979.

Québec. Ministère de l'Éducation. Direction générale du développement pédagogique. **Cadre relatif à l'élaboration des programmes et des guides pédagogiques.** Québec: ministère de l'Éducation, January 1980.

Québec. Ministère de l'Éducation. Direction générale du développement pédagogique. **Guide docimologique - Introduction à la mesure et à l'évaluation.** (Code: 16-7251). Québec: ministère de l'Éducation, 1978.

Québec. Ministère de l'Éducation. Direction générale du développement pédagogique. **Guide docimologique - Notions sur la taxonomie.** (Code: 16-7253). Québec: ministère de l'Éducation, 1977.

Québec. Ministère de l'Éducation. Direction générale du développement pédagogique. **Guide docimologique - Les instruments de mesure utilisés dans le cadre de l'évaluation normative.** (Code: 16-7254). Québec: ministère de l'Éducation, 1978.

BIBLIOGRAPHY (continued)

Québec. Ministère de l'Éducation. Direction générale du développement pédagogique. **General Policy for Educational Evaluation for Preschool, Elementary and Secondary Schools.** (16-7500A). Québec, ministère de l'Éducation, 1981.

Tawfick, L. G. and Bélair. **L'entreprise et ses fonctions.** Montréal: Éditions H.R.W., 1979.

Van Valkenburgh. **L'électricité.** 13th ed. Vol. 1. Paris: Éditions Gamma, 1975.

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- GENERAL METHODOLOGY
- PLANNING MODEL - GENERAL EDUCATION

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15	TV Ontario Marketing	- P.O. Box 200, Station Q Toronto, Ontario M4T 2T1 (416) 484-2613
16	Visual Media Resources Audiovisual Department Concordia University Sir George Williams Campus	- Room 341, Hall Building 1455 de Maisonneuve Blvd. West Montréal, Québec H3G 1M8 (514) 879-5974/4434
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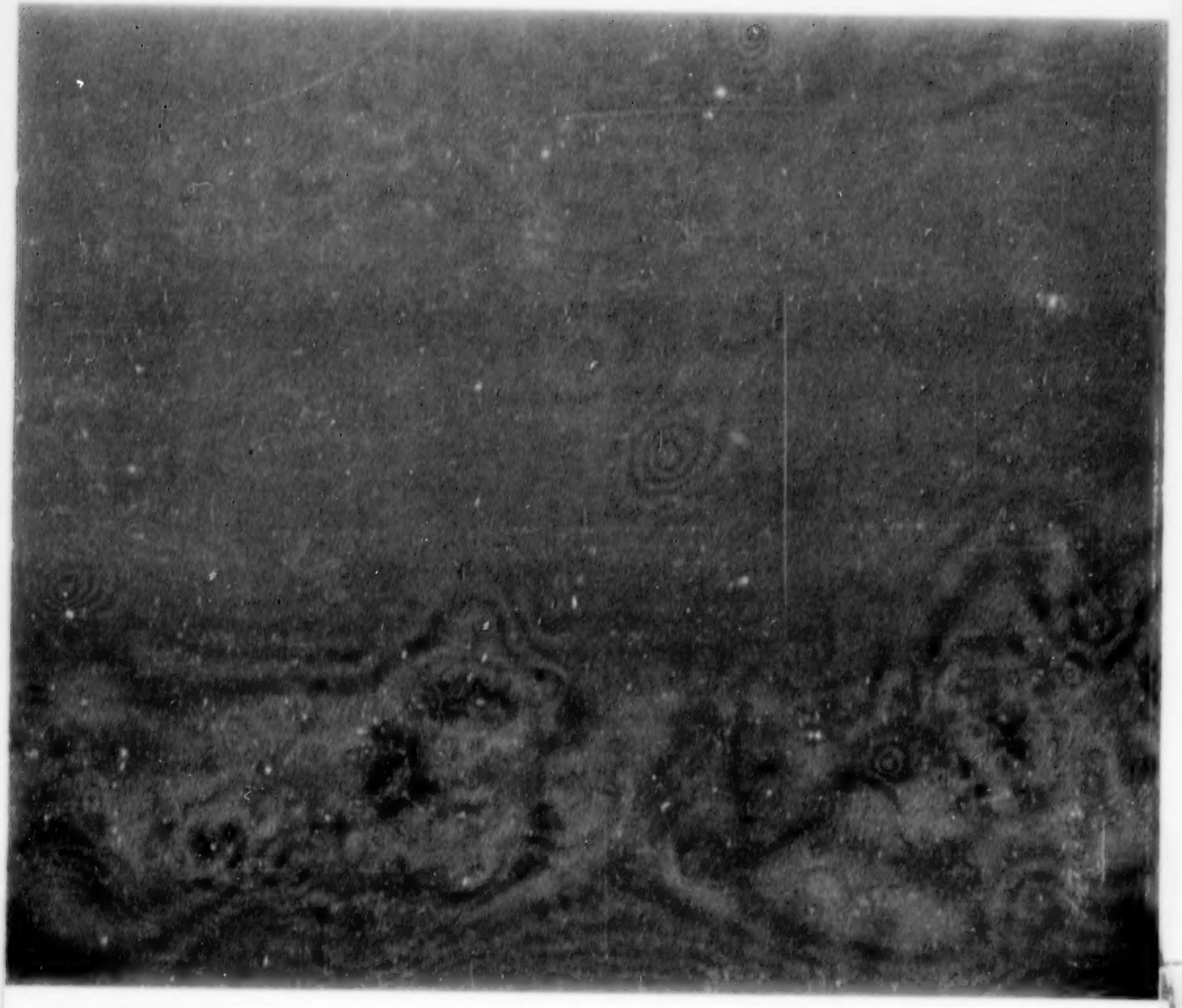

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